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## GELATIN IN SHOCK

### (THE USE OF A SPECIAL GELATIN SOLUTION AS A SUBSTITUTE FOR BLOOD AND BLOOD PLASMA—REPORT OF THIRTY-TWO CASES)

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### IMPORTANCE OF SHOCK IN CIVILIAN MEDICAL PRACTICE IN INDIA

Shock is a very important military problem. So much so that the allocation of staff and *matériel* for the prevention and treatment of shock was one of the major concerns of the army, navy, air force and civilian defence forces during the recent war. However, shock is not just a military problem. It is also of major importance to the physicians and surgeons who care for the civilian population, in peacetime as well as in time of war.

This is especially true in India. Although the incidence of trauma from motor and industrial accidents is not proportionately as high as in many other countries, the incidence of shock in those cases of trauma which do occur—motor, industrial and the more common accidents of rural life—is quite high, because of a lack of any general knowledge of proper first aid and because of unavoidable delay in getting the patients to the hospital. Ineffective or even harmful first attempts at treatment in the village, as well as delay, make shock an important consideration also in the treatment of a large proportion of the patients admitted to hospital with burns, prolonged labour, haemorrhage (obstetrical and other types) and intestinal obstruction and other abdominal emergencies. Furthermore, in many parts of the country chronic anaemia, nutritional deficiencies (especially of protein) and parasitic infestation as well as dehydration in the hot weather contribute to a high incidence of shock among both surgical and medical patients in the hospital.

### BLOOD AND BLOOD PLASMA—THE RECOGNIZED MODERN REMEDIES

During the recent war, in nearly all military hospitals (and in civilian hospitals in some countries) and even right on the battlefields, remarkable results have been obtained in the prevention and treatment of traumatic, haemorrhagic and burn shock by the liberal use of whole blood and blood plasma. Whole blood was found to be best in haemorrhagic shock, severe traumatic shock[1, 2, 3], and in some stages of burn shock[4]; plasma was used at the front line, and while waiting for whole blood, as well as in the other types of shock. It also became routine to give liberal quantities of blood plasma or whole blood during the course of all but the simpler operations in the prevention and treatment of operative and post-operative shock. Unfortunately, the satisfactory treatment of shock and also the undertaking of many of the more serious and prolonged operations in surgery are seriously handicapped, if not prevented, in most civilian hospitals in India, because we can rarely use these ideal remedies—blood and blood plasma.

### DIFFICULTY OF GETTING BLOOD DONORS

Fortunate indeed is the woman with a ruptured ectopic gestation, in comparison with most cases of hæmorrhage, for she carries right with her the blood in a sterile cavity, from which it may be obtained and returned to her circulation. In other types of hæmorrhage or other types of severe shock, a strenuous search must be made for someone who is willing to part with some blood to meet the emergency. Valuable time is often lost in trying to persuade relatives or even in having to bargain for purchase from a single compatible "donor". All too often the patient dies or goes through a precarious and prolonged convalescence because of the reluctance of anyone to give or even to sell his blood. Except in recent months when an occasional bottle of blood plasma has found its way somehow from the surplus military stores, it has been much more difficult to get plasma than to get whole blood.

### SATISFACTORY BLOOD DONOR SYSTEMS CAN BE ESTABLISHED

This "donor resistance" can be overcome with sufficient education. The huge blood and plasma procurement programmes in the countries of Europe

and America and a similar programme in a few of our Indian cities during the recent war demonstrated that millions of people were willing not only to give blood to their own relatives, but also to the soldiers of their country and of their allies. "Civilian disaster" stocks of blood plasma and whole blood have also been established in many places, and the "Blood Bank" system which has worked so well in the West, has been successfully established in a few of the large city hospitals in this country. In some other hospitals, blood is made available with only slight delay by keeping lists of acceptable, tested and willing donors who give blood at a fixed price. But unfortunately there is still a great gap between the need for blood and the provision for its supply.

### Commercial Blood Plasma

In America a number of pharmaceutical firms purchase blood at a fixed price and at suitable intervals from rigidly tested donors and prepare blood plasma for sale. A similar plan is needed in India. For, it is a scandal that the only blood plasma obtained here at the present time is from blood *freely given* by the citizens of America, England and other allied countries to save the lives of their armed forces, and that this plasma is now being bought and sold, sometimes at enormous profits. There are many poor people who might profit by selling reasonable amounts of their blood, but their ignorance and consequent unwillingness, as well as the necessity for rigid testing and retesting of such donors in order to make the blood plasma safe to use will make progress slow. However, some of the Indian pharmaceutical firms should at least make a beginning in the preparation of blood plasma which can be placed on the market at a reasonable price. For the potential demand is great.

### No Recipient Resistance

Curiously enough, the resistance to the receiving of blood has almost disappeared. The value of blood and blood plasma in many illnesses as well as in the emergencies is widely recognized by the public. Many relatives are quite willing to purchase, even though they may be unwilling to give blood.

### India Needs More Satisfactory Blood Substitutes

It will take considerable time for the campaign of education to overcome donor resistance and for the development of a stable commercial supply of blood plasma. In the meantime, we cannot be complacent about our present high mortality rates from shock, even though in many cases the death certificates show only 'burns', 'haemorrhage', 'prolonged labour', 'heart failure', or 'complications after operation' as the cause of death. Nor can we be satisfied to continue, when blood or plasma are not available, to use only saline and glucose solutions, remedies which were tried and found wanting in the prevention and treatment of shock by the military surgeons of the first world war. We must turn, as they did, to the search for more satisfactory substitutes for blood and plasma.

### Gelatin Solution as a Plasma Substitute

We began our work with gelatin in May, 1944. The results of this work, which are presented here, taken with the published results of other workers which will be cited, have convinced us that gelatin solution is a very valuable plasma substitute for the treatment of various kinds of shock. It can substitute for whole blood only in the way that plasma can—by delaying the acute need for blood or as one might put it, by converting haemorrhagic shock into subacute anaemia. We believe that as soon as sufficient of this specially prepared gelatin solution can be made available to all of the hospitals in this country, a long step forward will have been taken in the provision for the adequate care of shock.

### Brief Review of Literature

It is of great interest that gelatin was first introduced as a blood substitute during World War I.[5] Military surgeons then were faced with the same situation that we now face in India—the knowledge that saline and glucose solutions by themselves are inadequate for severe shock, and a great difficulty in getting sufficient blood for transfusions. Acacia or 'gum glucose' as the solution was popularly called, was introduced at about the same time.[6]

Steigmann *et al*[7] give the history of the early work on these two blood substitutes:—"The early favourable reports on acacia by Bayliss[8], Rous and Wilson,[9] were superseded later by reports which indicated that the use of acacia may be dangerous. Thus, acacia was incriminated as causing injury to the circulatory and respiratory systems,[10] that it was antigenic,[11] that it was deposited in the liver and caused decrease of the plasma proteins,[12, 13, 14] and that it decreased the fibrinogen, delayed clotting and prolonged bleeding time.[15]

"Gelatin was less intensively studied than acacia, but the reports were rather favourable,[16] although Amberson[17] considered it valueless because of the rapidity with which it leaves the blood stream. However, renewed interest in gelatin and other plasma substitutes came to the foreground with the beginning of the present war as evidenced by a number of recent investigations.

"Gelatin solutions were found useful as plasma substitutes by various workers in one-stage hæmorrhage,[18, 19, 20, 21 22] in two-stage hæmorrhage[23] and in prolonged bleeding.[20] Favourable effect in shock due to trauma[24, 25] and due to burns[20, 26] has also been observed. Gelatin was found to escape more slowly through injured capillaries than serum.[27] According to some[28, 29] gelatin allegedly maintains nitrogen equilibrium."

In studying the results of many workers who have used gelatin solution to test any possible untoward reaction, on both animals and normal humans, in the treatment of experimental shock (traumatic, hæmorrhagic and burn) in animals, and also in the treatment of various types of shock in patients, it is well to consider those requirements for an ideal plasma substitute which Taylor and Waters[22] have given, and with which most other workers agree:—

(*a*) The molecule of the dissolved substance must be of such a size that the fluid will not leave the vessels too freely.

(*b*) The solution must exert an osmotic pressure and possess a viscosity approaching as closely as possible that of whole blood; these qualifications depend upon molecular size and shape.

(*c*) It should be as nearly as possible isotonic with the contents of the erythrocytes.

(*d*) It must, of course, be non-antigenic and innocuous in every respect.

In addition, it should be readily available, preferably cheap and capable of being quickly and easily prepared for intravenous administration.

How well does gelatin satisfy these criteria? Let us consider them in reverse order. There was a great deal of variation in the early work because of differences in the material used, and in the methods of preparation of the gelatin. It was soon found that simple sterilized preparations of ordinary food gelatin, or even of gelatin prepared for bacteriological work were neither reliable in their effect nor were they free from unfavourable reactions. The best results have been obtained with solutions prepared, buffered, bacteriologically tested and standardized as to molecular size by the manufacturer and supplied to the investigators ready to use in transfusion bottles. This means that proper gelatin solutions for intravenous use in the treatment of shock cannot be quickly prepared in the ordinary hospital laboratory. They must be prepared in a manufacturing laboratory with considerable equipment. However, this is compensated for by the fact that the source of material for gelatin is relatively cheap and when large volume production has been attained, good ready-to-use gelatin solutions should be available at a price somewhat cheaper than commercially obtained and processed plasma.

Although gelatin is a protein, it is not antigenic[17, 21, 22, 23, 30], which is an exceedingly important consideration. It can therefore safely be given and given repeatedly. When given in very large amounts, a tendency to thrombosis in the veins in which it is given was reported[7], but this was later found to be due to a chemical preservative which is not used at present in preparation. We have not found any difficulty of this kind in the clinical use of small quantities of the solution. A number of workers have shown conclusively that both normal and shocked individuals will tolerate without ill effects, amounts varying 1,000 to 10,000 c.c. of the gelatin solution.

Since gelatin is an incomplete protein, Steigmann and his co-workers (*loc. cit.*) have tried gelatin solutions which have been fortified with tryptophane, tyrosine, methionine and leucine. They have shown that these mixed solutions are also well tolerated and have performed kidney and liver function tests on patients who have received plain gelatin or the mixture which proved the innocuousness of these solutions.

Certain changes are produced in the blood following the introduction of gelatin solution. There is a rise in the blood sedimentation rate[7] which has not been adequately explained. There is also a pseudo-agglutination effect which has been noted[31, 32]. This loose clumping of the red cells apparently does no harm to the patient but it does make blood matching a little difficult after the giving of the gelatin solution. However, this difficulty can be easily solved by the method of Koop[32, 33] who adds one drop of 1 % glycine to the slide before mixing the cells and serum and then mixes the 3 drops. This prevents the pseudo-agglutination and allows a normal matching to be carried out.

As mentioned above, gelatin is a substance that when properly prepared has the requisite molecular size and shape to exert a beneficial osmotic pressure and has been shown to leave the injured capillaries at even a slower rate than serum[27]. But the size of the protein molecules in the finished product has been shown to vary a good deal with the source of the gelatin[22], and with the methods of preparation[32].

The workers in Canada have concentrated their work mainly on *isinglass*, a type of gelatin obtained from the swim-bladders of fish and they have found the solutions prepared from this substance to be very useful in the treatment of shock[21, 22]. In the United States, two different sources have been tapped to obtain gelatin. One of these is the skin of meat animals[31, 34], and the other is bone collagen, which is the usual source of food and laboratory gelatin. For intravenous use however, the gelatin is prepared quite separately and by a different method. The latter type is usually referred to as "osseous" or "ossein" gelatin.

## Preparation of the Gelatin Solution Which We Have Used

The Gelatin solution which has been used in our studies reported here was supplied through the courtesy of Dr. D. Tourtellotte, Director of Research of the Charles B. Knox Gelatine Co., Johnstown, N.Y., U.S.A. This is the solution Knox P-20 referred to by the National Research Council (of the U.S.A.) in its report on Gelatin as a Plasma Substitute[35]. Koop[32] has described the preparation of this gelatin solution which he had given to over 200 patients, as follows:—

"The gelatin solution which has been most satisfactory is one prepared by hydrolysis of alkali-treated long bone collagen under controlled and standardized conditions. It is administered as a 6 per cent solution in physiological salt solution after

autoclaving for twenty minutes. This solution is preferred for the treatment of shock because its method of preparation produces the optimum molecular size of the gelatin, upon which its physiological action largely depends.

"When gelatin solutions are subjected to high temperatures, such as those required in sterilization by autoclave, the long gelatin aggregates molecule is broken down to form a larger number of smaller molecular particles. Whereas the smaller molecules theoretically exert a higher oncotic pressure, they are excreted from the blood stream through the kidneys so rapidly that their effective oncotic pressure is short-lived and not of the sustained value of the larger molecules which actually exert a lower osmotic pressure.

"For this reason two factors are of importance in the manufacture of gelatin solution as a plasma substitute—the source of the gelatin and the method of preparation of the solution. Bovine long bones are a better source of gelatin than skins, hides or fish products because of their relative freedom from bacterial and fungus contamination and their uniformity of composition. Solutions prepared from such gelatin require the minimum of heat in the process of manufacture to rid them of bacterial contamination and therefore it is possible to produce the most sustained effect on oncotic pressure. A twenty-minute period of autoclaving for such solutions maintains a sufficiently large molecule while making bacteriological sterility certain.

"Gelatin solutions for intravenous use should be prepared for that purpose and apart from commercial manufacture of edible gelatin. Even the use of pure U.S.P. edible gelatin in the preparation of intravenous solutions may result in a pyrogenic product because of impurities that may render it unfit for parenteral use.

"There are several advantages in the preparation or processing of gelatin solutions. Whereas the preparation of plasma must be undertaken with the most rigid sterile technic, gelatin solutions if prepared with reasonable cleanliness can be thoroughly sterilized in the last step in manufacture by autoclaving and Seitz filtration. Gelatin solutions need not be refrigerated, as fresh plasma must be, and they can be kept in a single container as compared with the two needed for lyophilized plasma.

"When solution is prepared in a single dose package, no preservative need be added. This avoids the possible danger of chemical phlebitis due to preservatives.

"The great advantage of gelatin is that it is readily available at relatively low cost and that we are not dependent upon blood donations to obtain it. This is of special importance in localities and hospitals where plasma banks are not established."

## Method of Administration

The most convenient method of using gelatin solution is simply to connect up the bottle in which it is supplied with the plasma or blood giving set such as was supplied to the armed forces, after removing the metal cap over the rubber stopper and sterilizing the surface of the stopper with spirit. In the tropics it is scarcely ever necessary to warm the solution before giving it, except occasionally in the cold season. But in the temperate zone, it may be necessary to warm the bottle so as to change the gelatin from the gel to the fluid state. Warmed to about 50 degrees centigrade, it will usually stay in the fluid state until all has been introduced into the vein.

Because of the relatively high viscosity of the gelatin solution, needles should be used which are larger than the usual intravenous size. It is better to use blood transfusion size needles, not smaller than 18 gauge, and preferably 14 to 16 gauge. In the treatment of shock, it is wise to give the gelatin solution rapidly—500 c.c. in half an hour, or occasionally faster. Sometimes a slower rate is sufficient. Koop (*loc. cit.*) recommends an average rate of 10 c.c. per minute. The special needs of the case should determine the rate of flow for both the gelatin solution and for saline solution given before or after the gelatin. In the severely shocked patient who is also dehydrated and in whom there is marked venostasis, it is sometimes necessary to raise the bottle quite high, giving a strong gravity-pressure to the solution until the first 100 c.c. have been got into the vein. (This procedure will be familiar to those who have used this technic in starting saline infusions in cholera patients.)

## Physiological Properties of Gelatin Solutions

On experimental normal animals, on animals with experimental shock of various types, on normal human controls, on volunteers who have been subjected to experimental haemorrhage and on patients with various types of shock, the effects of intravenous infusion of gelatin solution have been studied by many workers[5, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 32, 34, 36, 37, 38, 39] etc. Most marked and of greatest clinical interest are the effects of gelatin on the circulation. When 500 c.c. of 6 per cent gelatin solution are infused into a normal individual, the the increase in blood volume, cardiac output, systolic blood pressure, serum protein concentration, and venous pressure, accompanied by a fall in the hematocrit[32, 39] are usually evident by the time the infusion is finished (given at 10 c.c. per minute—Koop (*loc. cit.*). These circulatory changes reach their peak at the end of three hours, and return nearly to normal at the end of 24 hours, except that the increased blood volume may not return to normal until 48 hours, at which time the gelatin has usually all left the blood stream. But the change in blood volume, and in arterial blood pressure is much more striking in the shocked than in the normal individual.

## Clinical Use of Gelatin Solution in India

When we started our clinical research on this subject at Hanumakonda in May 1944, there were as yet very few published reports of the *clinical* use

of gelatin and those usually of small series of cases. But we could be assured that it was safe, not likely to produce any serious reactions and that in many animals and in some patients it seemed to offer an improvement on the simple use of saline or saline and glucose. The conclusions drawn by Gordon, Hoge and Lawson[23] were typical of the opinion of workers at that time:—

> "Gelatin solutions appear to occupy an intermediate position between blood and crystalloid solutions in their ability to maintain the circulation after blood loss. The restoration of the circulation by gelatin lasts sufficiently long to cover many clinical emergencies. Since" . . . there is no . . . "demonstrable toxicity for the dog, further study with a view to clinical trial is indicated."

Similar reports had been published with regard to the clinical trials.

We did not have any prospect of getting blood plasma for making comparative tests. But we were mainly interested in getting something better than the crystalloids and we could make comparisons between our cases treated with saline and glucose and those treated with gelatin, or with a combination of gelatin and the crystalloids.

### Plan of Study

As many workers have observed, it is impossible in clinical practice to obtain the controlled conditions of the laboratory. We had to work out a plan of study as we went along and to establish what criteria we could use for determining shock and the effect of the treatment on shock, which would be within the range of practical clinical methods. Our laboratory at Hanumakonda was equipped for only simple blood studies and we made these in a number of the early cases. But we could not then attempt the more elaborate blood volume, blood specific gravity, cardiac output, stroke volume, plasma protein concentration and other measurements which have been made by many of the workers who have been studying shock.

It soon became evident that we could follow the cases of shock and determine the effect of the solution injected for treatment quite satisfactorily by recording the general clinical condition of the patient at various stages of treatment and recording the arterial blood presure. We have continued to use these simple criteria, even though our more recent work has been carried on at Vellore (in addition to Hanumakonda), and we have had access to the Medical College Hospital Laboratory at Vellore. We are glad now that we have followed this plan, for the same simple clinical methods of recording the effects of treatment in shock which we have used to demonstrate the value of gelatin solution are available in the many civilian hospitals, large and small, in India, which we believe will wish to record their own results with gelatin solution when it becomes available for their use.

Our judgment in this matter of using clinical observation and only simple laboratory tests for this study is upheld by the comment of Abbott[40] at the end of his very full and instructive article on "Fluid, Electrolyte and Nutritional Problems", in shock, trauma, haemorrhage, intestinal obstruction, etc. We quote:—

> "The importance of frequent study of the patient, rather than reliance solely upon the various blood concentrations, cannot be overemphasized. Obviously, the careful examination and evaluation of all the findings (history, physical examination, clinical course, laboratory reports) give the best results and one without the others leads to confusion.
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> "Evidence also seems to be accumulating to show that the haematocrit, haemoglobin, red blood cell count and the whole blood specific gravity are not good indices of the state and extent of an existing deficiency or of the amount and type of therapy to be employed ([40] quoted by [39]). Although some recent reports continue to advocate such methods for controlling post-operative patients and those in shock, there are few studies which provide evidence in support of these clinical rules which were for the most part based on theoretical work.
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> "It is hoped that the previous discussion will not leave the impression that blood chemical studies are useless but rather than their interpretation should be based on a sound physiological knowledge."

He might have added that such studies can often be misinterpreted. However, since our work began, there have been a number of excellent studies from the West[7, 32, 36, 39, 41] which have included more elaborate laboratory studies along with their clinical observations on the use of gelatin in shock. These studies corroborate our observations here and offer convincing proof of the value of gelatin solution in shock.

### Types of Shock Treated

We began our series (of over 80 cases treated to date) with a group of desperate obstetrical cases (labour prolonged for three or four days, acute severe haemorrhage, or a combination of the two) of a type which had previously shown only temporary or no improvement when treated with saline and glucose alone. On these cases we are able to demonstrate that gelatin was safe to use. The results in a few cases were spectacular, when we used 500 to 1,000 c.c. of gelatin solution, followed up usually with saline and glucose. But there were many failures. Later we realized that many of those cases should have been recognized as "terminal" or "irreversible" shock (*vide infra*). Even had we been able to give whole blood to them[42] or still larger amounts of electrolyte or colloid solutions[43], we would still have met with failure in irreversible shock.

We then proceeded to treat burn shock, traumatic shock, haemorrhagic shock from gastric, tubal abortion as well as obstetrical cases, shock in connection with several types of acute infection, opera-

tive and post-operative shock, and the peculiar type of shock found in intestinal obstruction and in cases of peritonitis from various causes. Our results improved as we learned how best to time the giving of the gelatin solution and how much it was necessary to use in order to get the desired result. In a few cases we were able to compare the results with those obtained from plasma or whole blood, either in the same cases or in similar cases, but in the main our comparisons continued to be with the results from saline or saline and glucose.

Still dissatisfied with our results in some of the desperate cases, we corresponded with Page and Kohlstaedt[42], who had been working on irreversible shock and through their courtesy we were able to get a small supply of tuamine sulphate. This remarkable drug, combined with blood, plasma or gelatin produces spectacular results in terminal shock. (Our results on our small series of cases treated with tuamine is being reported in a separate paper[44]). We also found that some cases were being allowed to go on into terminal shock, even though there was a needle in the vein, because the rate of flow was not sufficiently rapid and also we found that in most cases of shock it was foolish to depend on saline given subcutaneously, intramuscularly and especially by rectum. The intravenous route was absolutely essential, if the saline or saline and glucose were to be effective, even in mild shock, or when saline was combined with gelatin in severe shock. In this connection, we believe that the common use of the term and the method, certainly as applied to shock—"intravenous *drip*"—should be abandoned in favour of the idea and method of intravenous *flow*.

## Quantity of Gelatin Solution to Use

In the early part of our study we limited the amounts of gelatin solution given to 500-1,000 c.c., because we still did not know how much it was safe to give. In the latter part of our work we were limited by difficulties in obtaining a sufficient supply of the gelatin solution. Our work had to be largely interrupted in 1945 because of delays in getting import permits, and then by the fact that the manufacturers had to divert supplies intended for us to urgent military orders. However, because we have had to spread out our supply to cover as many cases as we could, we have been able to demonstrate the remarkable effect which even 500 c.c. of the gelatin solution will produce if given at the right time. When so given, its effect can be maintained, even in marked conditions of shock, by addition of saline and glucose, whereas the latter would not have been effective without the gelatin.

## Value of Gelatin Solution as a Prophylactic against Shock

After demonstrating the value of gelatin solution in the treatment of shock occurring during or after major surgical operations, we were naturally interested in developing a regime which would prevent shock entirely. A few of the cases in which we have used gelatin solution prophylactically are indicated in the series reported here. (Others will be published in a later paper.) Koop (*loc. cit.*) reports similarly encouraging results with gelatin as a supportive measure in operative surgery, in preventing the anticipated fall in blood pressure in connection with spinal anaesthesia, as well as in emergency surgery under any type of anaesthesia. Necheles *et al*[45] also report favourable results with gelatin infusion before operation in experimental animals.

## Precautions in the Use of Gelatin Solution

Although we have not yet met with any difficulties in this regard, Koop (*loc. cit.*) warns that in preparing a patient for operation or in using the gelatin solution during an operation, the rate of flow or the total amount given should not raise the blood pressure to the extent that bleeding would be encouraged or clotting prevented. While giving gelatin solution one should be satisfied ordinarily to keep the systolic blood pressure in the vicinity of 100 ; and should also observe the patient for pallor which might indicate internal haemorrhage, even in the presence of a maintained blood pressure. For this reason, repeated doses of gelatin solution are often better than a continuous administration.

One should usually avoid giving gelatin solution in patients with demonstrable heart disease, because of the marked increase of blood volume which follows its use.

## Further Work Required on the Uses of Gelatin

1. *Optimum quantity of gelatin to use in shock.*—As more liberal quantities of the gelatin solution become available for our use, we will be able to determine what is the best quantity to use in both treatment and prevention of shock.

2. *Optimum quantities of saline to use with the gelatin under different conditions and for different types of shock.*—Because gelatin solution is good, it must not be assumed that it can entirely replace the use of saline in shock. Our own experience and that of others[41] would indicate that the best results are to be obtained from a combination of colloids and electrolytes.

Since the end of World War II, there has been considerable discussion as to the relative place of colloids and electrolytes in the treatment of shock. The large use of blood plasma, more or less to the exclusion of saline, by the Allied Military Medical Departments during the war has been called into question by Crossman and Allen[46], who claim that isotonic salt solution is equal to or superior to plasma. Rosenthal and Tabor[47] carried out experiments involving over 10,000 mice which seemed to indicate that the effect of serum or plasma could be accounted for by the amount of isotonic sodium which they contain. Tisdall[48], among others, has defended the war policy with regard to plasma, and Winkler *et al*[41] have shown in their experiments

that both serum and gelatin exert an influence quite apart from their sodium content.

Thus there seems to be a tendency to take sides and to over-emphasize either colloids or electrolytes on the part of some authors. One must keep this in mind in evaluating their work. However, there is a great deal of interest and much of practical value in a large number of recent articles[47, 49-57]. A study of these should help us to plan the best possible regime for the treatment of shock in India. We need also clinical research under Indian conditions. Our own experience points strongly to the need for both colloids and crystalloids, in all types of shock. For burns, intestinal obstruction, peritonitis and some of the cases of severe dehydration in the hot season, we still have to determine the optimum proportions.

3. *Intra-arterial infusion of Gelatin.*—Kohlstaedt and Page[58, 59] have found that in very severe shock, blood or plasma injected directly into the femoral artery gives excellent results and with less blood or plasma than needed when given by vein. We hope to report later on a series of cases in which this method is used. It would certainly be profitable for others also to try this method, whether they use blood or plasma, gelatin solution (when it becomes available to them) or even some of the electrolyte solutions.

4. *Gelatin in the Treatment of Oedema.*—Koop (*loc. cit.*) reports success with gelatin solution P-20 in certain cases of oedema associated with starvation, liver cirrhosis and nephrosis, and in some cases of terminal anasarca. He strongly advises against its use in cardiac oedema, as in cases of heart failure, because of the characteristic increase in blood volume after gelatin. (Maximum is reached in about 3 hours). The mercury diuretics given after the daily infusion of gelatin in the cases of oedema which he treated gave better results than either remedy used alone. There is as yet no completely adequate explanation of this effect, but it might be related to the use of gelatin mentioned in the next section. We have not yet tried gelatin for oedema, but hope to do so, for we have many of the types of cases which Koop treated, in the medical wards.

5. *Gelatin Solution as a Source of Protein Nutrition.*—Perhaps because of the knowledge that gelatin is a protein which lacks four of the essential amino-acids, many of the earlier workers concluded that gelatin was not used at all in nutrition, when given by the intravenous route; and that it was valuable only for its colloidal osmotic pressure effect. Hoffman and Kozoll[38] studied a number of different gelatins made by the Upjohn Co. They classified these according to their molecular weights as "heavy", "intermediate" and "light".' Their results seemed to indicate that the gelatin was quantitatively excreted in the urine, although it took 4 or 5 days for all of the heavier-moleculed gelatin to be excreted. They found no significant rise in serum non-protein nitrogen or urea nitrogen during or after the injection of gelatin, and therefore concluded that the gelatin was not being used for nutritional purposes.

However, there seems to be the possibility that the methods used by these workers were not quite adequate in distinguishing between gelatin and other nitrogenous fractions in the urine. For later reports have shown that 50 to 75 per cent of the gelatin is not recovered from the urine[32], and yet no gelatin has been found stored as such in the viscera[20, 37]. It must be assumed therefore that some of the gelatin is metabolized. Whether it is all broken down, or whether it can be used in part at least for the making of serum protein or other body proteins is not yet completely clear. Recent reports from Brunnschwig *et al*[60] would indicate that gelatin solutions, especially if given in combination with protein digest solutions, or amino-acid solutions, do add to the body protein in a larger amount than can be accounted for by the amino-acid solutions alone. Furthermore, the work of Koop (*loc. cit.*) with oedema in cases which were largely those of hypoproteinaemia would seem to indicate nutritional usage of the gelatin when given intravenously.

Hoffman and Kozoll (*loc. cit.*) used "normal hospital controls", and bone gelatin for their work. Presumably, these patients had no protein deficiency. This may, at least in part, explain why their results differ from those of Brunnschwig *et al* (*loc. cit.*), who used pig-skin gelatin in dogs, and Koop (*loc. cit.*) who used Knox P-20 ossein gelatin on hypoproteinaemic patients as well as on normal subjects. The truth may be that the amount of utilization of the gelatin depends upon several factors: source, methods of preparation and size of the molecules of the gelatin used; and upon whether there is a chronic protein deficiency or an acute protein lack in the animal or person to whom it is given.

It would certainly be of great value if we could use gelatin solution, either alone, or in combination with a protein digest, intravenously, for the building up of the protein reserves, as well as for the prevention of shock in the many protein depleted patients who come to us for surgery. This method would seem to be especially valuable in cases of pyloric obstruction, and we hope to continue our studies further in this matter.

6. *Further Study of Shock in Connection with Infection.*—Throughout our work on shock we have noted that when peritonitis or other infection has been the cause of the shock, or associated with it, we have had many failures, even though a temporary benefit might result with the use of gelatin solution. Freeman[61] comments on the failure of the administration of blood to combat shock which is due to infection. Ebert and Stead[62] have shown that when peripheral circulatory failure is due to infection, there will be no response to simply increasing the blood volume, but only to controlling the infection. This point is well illustrated in case 19 of the series here reported. The peritonitis was controlled with penicillin, and only then did the shock clear up. In some of the other cases where infection was not brought under control, the treatment of shock was not permanently of value. Further work along this line is much needed—combining gelatin with the newer chemotherapeutic agents.

TABLE 1—SHOWING REPORT OF 32 CASES TREATED WITH GELATIN SOLUTION

| *Data concerning patients: Series No., initials, age, sex, hosp. no., adm. and disch. dates, condition on discharge, diagnosis and complications.* | *Operation and other treatment. Blood pressure on adm. and pre-operative.* | *Gelatin solution: B.P. before gel. Amt. of gelatin. B.P. after gel. Remarks.* | *Other treatments for shock. Whether before or after gelatin. Amt. given. Response.* | *Type of shock. Comment on shock treatment.* |
|---|---|---|---|---|
| 1. R.C., 30, F, H-503. 20-3-47 to 20-3-47. Died. Placenta praevia, central. Bleeding, 12-18 hrs. Pulseless on admission. | Version and extraction, after 500 c.c. response to gelatin. | Improved so that delivery could be done. | After gel. saline, subpectoral. Did not maintain B.P. | Haemorrhagic. Improvement with one bottle of gelatin allowed delivery. More gelatin should have been given. Slowly absorbed saline not effective in maintaining effect after gelatin. |
| 2. D.V., 30, F, H-756. 6-6-46 to 26-6-46. Cured. Ruptured uterus, 34 hrs. after onset of labour, and 3½ hours before admission. | Abdominal delivery and subtotal hysterectomy. | One day after op. 500 c.c. Good response, maintained with I.M. saline. | Before op. saline & glucose. I.V. Good response to 2 pints. After op., 350 c.c. blood and 1 pint saline. Good response. After gel. 4 pints saline I.M. | (1) Haemorrhagic, (2) Post-operative. Haemorrhagic shock treated successfully with I.V. saline, followed by blood. Next day, post-operative shock developed, controlled with one bottle gelatin, followed by I.M. saline. |
| 3. S.R., 39, M, V-70839. 19-1-46 to 28-2-46. Improved. Gastro-jejunal Ulcer. (Anastomotic). 3 mo. Slight hæmatemesis. Slight anaemia. Post-op. pneumonia (7-21/2/46). | Partial gastrectomy and excision of anastomotic ulcer. High spinal anaes. Sulphadiazine for post-op. pneumonia. Pre-op. B.P. 130/92. | 95/70. 1,000 c.c. 126/98. Elevation in B.P. and general improvement. | After gel., saline & glucose i.v. 1 pt. B.P. well maintained. 135/95 12 hrs. after starting gelatin. Saline i.m. 4 pts. during next 3 days maintained condition. | Operative. Gelatin started when lowered B.P. indicated impending shock. Therefore response was prompt and lasting. |
| 4. C.C., 50, M, V-70937. 26-1-46 to 16-2-46. Died. Carcinoma of stomach, 5 yrs. Partial gastrectomy & gastro-jejunostomy 3 yrs. ago. Increased symptoms 6 mths. Anaemia. — H. B. 45%. Occult blood in stools. | Exploratory laparotomy; gastrotomy —biopsy taken within stomach. High spinal plus intravenous anaesthesia. Adm. B.P. 170/120. Pre-op. B.P. 150/80. After high spinal, B.P. 100/60. | B.P. not obtainable. 500 c.c. After this and 2 pts. saline and glucose I.V., B.P. 165/110. Elevation of B.P. to more than pre-op. level; general improvement. | Before gel. Anacordone 1 amp. B.P. continued to go down. After gel. saline & glucose I.V. Response to gel. well maintained. B.P. 7½ hrs. after gel. started 140/90. | Operative. Man with labile type of hypertension showed characteristic drop in B.P. after spinal anaes. and further evidence of marked shock toward end of operation. No response to Anacordone. Prompt response to gel. followed by intravenous saline and glucose. (Post-op. recovery continued but patient died of hopeless cancer 5 days after operation). |
| 5. K., 30, M, V-70323. 8-2-46 to 26-2-46. Cured. Doudenal ulcer with pyloric obstruction. Anaemia, occas. haematemesis. Post-op. pneumonia. | Gastro-jejunostomy. High spinal anaes. Sulphadiazine for post-op. pneumonia. Adm. B.P. 120/85. | Before gel. B.P. 95/60 500 c.c. After this and 2 pts. saline I.V. B.P. 140/100. Elevation of B.P. and general improvement. | After gel. 2 pts. saline intravenously. Maintained response to gel. B.P. 10 hrs. after start of gel. 155/110. | Operative (moderate). While shock signs were only manifest to moderate degree, gel. was started and response was prompt and maintained well with saline following the gelatin. |
| 6. P.S., 60, M, V-71198. 11-2-46 to 13-2-46. Died. Peptic ulcer 10 yrs. Haematemesis. Perforation of ulcer. Severe shock. | None. B.P. Pulseless on admission and B.P. unobtainable. | B.P. not recordable. 500 c.c. B.P. 88/?. Temporary elevation of systolic pressure only. | After gel. saline & glucose I.V. 4 pts. Little or no effect. May have even hastened the end. | Haemorrhagic and Peritonitic, "Irreversible" stage. Only slight response to gel. and none to I.V. saline marks this case as not only very deep shock but shock in the irreversible stage. |
| 7. G.C., 30, M, V-71397. 19-2-46 to 11-3-46. Cured. Peptic ulcer 8 yrs. Anaemia. | Partial gastrectomy and gastro-jejunostomy. Adm. B.P. 120/80. | Before B.P. 115/75. 500 c.c. After this and 1 pt. saline I.V. B.P. 130/96. Shock prevented, normal B.P. maintained. | After gel. saline I.V. 1 pt. B.P. fell to 104/76 2 hrs. after stopping, but returned to 120/86 7 hrs. later Further saline next day. | Potential operative—prophylactic treatment. On basis of previous experience, gel. solution followed by saline I.V. was used at first sign of drop in B.P. during operation. All signs of shock prevented. Better post-op. recovery. |

TABLE 1—*Continued*

| *Data concerning patients: Series No., initials, age, sex, hosp. no., adm. and disch. dates, condition on discharge, diagnosis and complications.* | *Operation and other treatment. Blood pressure on adm. and pre-operative.* | *Gelatin solution: B.P. before gel. Amt. of gelatin. B.P. after gel, Remarks.* | *Other treatments for shock. Whether before or after gelatin. Amt. given. Response.* | *Type of shock. Comment on shock treatment.* |
|---|---|---|---|---|
| 8. A.D., 27, M, V-70802. 20-2-46 to 7-3-46. Cured. Doudenal ulcer 4 yrs. Pyloric obstruction 3 mths. Anaemia. | Gastro-jejunostomy. Adm. B.P. 125/95. | Before B.P. 84/62. 500 c.c. in 35 mins. After B.P. 118/86. Prompt elevation of B.P. | After gel. saline I.V. 600 c.c. Response to gel. well maintained B.P. 2½ hrs. after start of gel. 118/64. | Operative (moderate). Promptly controlled with gel. solution and effect maintained with saline. |
| 9. P.S., 47, M, V-71825. 15-3-46 to 29-4-46. Improved. Duodenal ulcer 20 yrs. Pyloric obstruction 1½ yrs. Anaemia. Post-op. vomiting, hiccough, uraemic convulsions, gluteal abscess. | Gastro-jejunostomy. Adm. B.P. 110/70. | 3½ days after op. (After severe vomiting). B.P. 110/50. 500 c.c. in 2 hrs. B.P. after 110/90. Prompt elevation of diastolic pressure. Systolic had remained stable. | After gel. saline I.V. 1 pt. B.P. maintained no further signs of shock during further post-op. complications. | Post-operative (moderate)—precipitated by severe vomiting. Promptly controlled with gelatin solution followed by saline. |
| 10. M.D., 38, M, V-72969. 18-5-46 to 10-6-46. Cured. Duodenal ulcer 2 yrs. Pyloric obstruction 1 mth. Anaemia, emaciation, dehydration, chronic G.C., urethritis & prostatitis. | Gastro-jejunostomy. Local anaesthesia (Novocain 1%) Sulphadiazine for gonorrhea pre-op. Adm. P.B. 104/68. Pre-op. B.P. 108/80. Post-op. B.P. 100/76. | B.P. 7 hrs. post-op. 90/60. After tap water and saline B.P. 80/70, before gel. (1) 500 c.c.—80/60. (2) 500 c.c.—88/68. Gelatin given too slowly 4 hrs. and 5 hrs. respectively) for optimal response but prevented further drop. | After op., before Gel. tap water drip by rectum 1 pt. Saline with glucose I.V. 2 pts. Did not prevent post-op. shock. After gel. saline and glucose I.V. 1 pt. Maintained response to gelatin and produced further improvement. | Post-operative shock. Developed during giving of rectal water and I.V. saline but checked by gelatin (1,000 c.c.). Further saline-glucose able to maintain and improve condition. Slight rise of B.P. during operation masked onset of shock, which should have been anticipated in dehydrated and emaciated man and prevented by pre- and intra-op. fluids. (Compare with cases 7 and 8). |
| 11. T.V., 80, M, V-73187. 29-5-46 to 31-5-46. Died. Appendicular abscess 8 days (plus ?). Acute nephritis. Pre-op. peritonitis localised. Post-op. peritonitis general. (Gastric haemorrhage). | Drainage of abdominal abscess. Low spinal anaesthesia. Sodium sulphathiazole I.V. Pre-op. B.P. 154/110. During op. B.P. 98/70. | 12 hrs. post-op. B.P. 105/80. Perspiring, hands cold. (1) 500 c.c.—116/85. (2) 500 c.c.—135/85. (Total in 6½ hrs.) slight improvement in shock but peritonitis increasing. B.P. 3 hrs. after gel. 140/95. | Before gel. immed. after op. rectal saline 1 pt., then I.V. saline and glucose 2 pts., after which B.P. 184/146. 5½ hrs. later shock marked. Next day, 12 hrs. after gel., B.P. 110/96 Saline and glucose I.V. 2 pts. No improvement. Heavy sedatives required. | Post-operative and Peritonitic. This is an unusual case, for the B.P. figures indicate the acute nephritis type of hypertension modified by the peculiar type of shock characteristic of peritonitis. Gelatin solution produces only temporary circulatory improvement in such cases. |
| 12. P., 45, M, V-73179. 28-5-46 to 15-6-46. Cured. Hernia, inguinal, right 2 yrs; incarcerated, 5 dys. intestinal obstruction 5 dys., vomiting 2 dys., cough 2 mths., nocturia 6 mths, dysuria 2 days. Blood concentration, Hb. 96%. Hookworm infestation. | Right inguinal herniorrhaphy (strangulated omentum; bowel only incarcerated). Local anaesthesia, Novocain 1%. B.P. not recordable on admission. | B.P. not recordable. (1) 500 c.c. After this & 1 pt. saline I.V. B.P. 3 hrs. after start of gel. 120/90. Prompt response maintained. (2) Pre-op. B.P.—120/90. Immediately after op. B.P. inaudible. Gel. (2) 500 c.c. in 1 hr. B.P. after gel. 80/?. Elevation of systolic pressure. | With gel. saline and glucose I.V. 1 pt. (Times and B.P. not recorded separately for saline & gelatin). Before second gel.—(during op.) saline and glucose I.V. maintained circulation during op. but did not prevent post-op. shock. After 2nd gel. 3 pts. saline I.V. continued the effect of gel. | (1) Shock of intestinal obstruction on admission. Followed 5 days of obstruction and 2 days of vomiting. In comparison with other cases satisfactory control of this type of shock was more prompt and lasting than with saline and glucose alone. (2) Post-operative. Shock developed during the operation though it was masked by I.V. saline and became apparent even while saline was given. Gel. 500 c.c. started recovery which was then maintained by 3 pts. saline in 12 hrs., at end of which B.P. 104/76. 7 hrs. later B.P. 124/80. |

TABLE 1—*Continued*

| *Data concerning patients: Series No., initials, age, sex, hosp. no., adm. and disch. dates, condition on discharge, diagnosis and complications.* | *Operation and other treatment. Blood pressure on adm. and pre-operative.* | *Gelatin solution: B.P. before gel. Amt. of gelatin. B.P. after gel. Remarks.* | *Other treatments for shock. Whether before or after gelatin. Amt. given. Response.* | *Type of shock. Comment on shock treatment.* |
|---|---|---|---|---|
| 13. S., 10, F, V-73514. 15-6-46 to present. Still under treatment. Improved. Tb. Osteomye l i t i s - ribs. 2 mths. Disch. sinuses. | Sequestrectomy and resection of rt. 10th and 11th ribs. Pre-op. B.P. 100/66. | Before gel. during op. B.P. 85/65. 500 c.c. in 1½ hrs. B.P. after gel. 98/64. Disappearance of shock sypmtoms though B.P. not quite to pre-op. level. | Gradual return to pre-op. condition without further I.V. fluids. | Operative (moderate). Prompt recognition of moderative operative shock and treatment with gelatin gave prompt effective and lasting response. |
| 14. R., 25, F, V-73710. 26-6-46 to 2-7-46. Died. Intestinal obstruction 6 dys. (Septic abortion 6 mths. ago, ill 1 mth.). Anaemia, dehydration. | (1) Ileotomy and excision of bands. Wangensteen suction. (2) Resection of externalized bowel and intestinal suture. Pre-op. B.P. 80/40. | About 15 hrs. after 1st op. B.P. 82/50. 500 c.c. slowly in 4¾ hrs. B.P. 74/34. Negative response. 1½ days later before 2nd gel. B.P. 60/25. 500 c.c. in 1½ hrs. B.P. 84/35. Slight rise—not maintained. | For adm. to op. saline or saline and glucose I.V. 6 pts. Improvement in initial stage but B.P. always low. Day of 1st op. I.V. saline 4 pts. and I. M. saline 2 pts. After 1st gel. during 36 hrs. before 2nd gel. I.V. saline 7 pts. and blood transfusion. B. P.—continued slowly down. After 2nd gel. blood plasma 250 c.c. and saline I.V. 4 pts. | Post-operative plus shock of intestinal obstruction and possible peritonitis. Persistent "sub-acute" shock lasted for several days. Large quantities of saline kept the patient living but did not markedly alter gradual downward course. Response to gelatin solution, blood, and plasma was not better, in amounts and at time given. It may be possible that more colloids given earlier in the course might have produced different results. |
| 15. V.R., 30, M, V-73764. 29-6-46 to 18-7-46. Cured. Chronic appendicitis. | Appendicectomy. Low spinal anaesthesia. Pre-op. B. P. 110/70. | Before gel. B.P.—100/60. 500 c.c. in 35 mins. B.P. after gel. 104/70. Rise in B.P., return of pulse almost to normal. | After gel. saline I.V. 2 pts. in 7 hrs. Response to gel. maintained. After saline B.P. 100/70. | Operative (mild), prophylactic treatment. Prompt use of gelatin during op. with spinal anaes. at first sign of fall in B.P. prevented development of any severe degree of shock. |
| 16. C.K., 60, M, V-72639. 28-4-46 to 22-10-46. Cured. Large diverticulum of urinary bladder (swelling noted for only 6 mths.). Urinary stasis & mild infection before op. (2). After op. (2) marked purulent inflam m a t i o n. Anaemia. Hb. 52%. Hookwork 2 infestation. | (1) Cystoscopy. (2) Suprapubic Cyst-ostomy, drainage of diverticulum & bladder. — Irrigations. (3) Excision of diverticulum, transplantation of l. ureter into bladder. Sulphathiazol powder locally at op. Adm. B.P. 90/60. Pre-op. B. p. 118/80. | Post-op. B.P. 105/80. 4 hrs. later 80/60. (1) 500 c.c. in 2¼ hrs. B.P. 74/42, then (2) 500 c.c. in 3¾ hrs. B.P. 88/50. Rise in B.P. maintained 2½ hrs. (3) 500 c.c.—17 hrs. later. Before gel. B.P. 85/50. After gel. 2½ hrs. later) 95/65. General improvement. | Before gel. (during op. 3) saline and glucose I.V. 1 pt. After op. saline I.V. 2 pts. After gel (2) saline I.V. 1 pt. and again 2 pts. After gel. (3) hourly feeding by mouth and nasal tube. Gradual recovery, but continued hypotension. | Post-operative. Occurred in a man who showed arterial hypertension at time of admission and at various times before and after op., in contrast with B.P. before and immediately after op. (3) Although 1st bottle of gel. did not stop fall in B.P. bottom reached and rise started during 2nd bottle. Perhaps more gel. given faster at that time would have been better. Satisfactory response to 3rd bottle gel. next day. |
| 17. M.S., 55, M, V-76457. 12-11-46 to 27-11-46. Cured. Hernia, lt. inguinal. Duration ? Strangulated 24 hrs. wth intestinal obstruction (6 mths. ago incarcerated 48 hrs. spontaneous reduction). Cough 20 yrs. Hookworm infestation. | Herniorrhaphy (Reduction of strangulated but viable loop of bowel). Open Aether anaesthesia. Wangensteen suction and Morphine q.4.h. to prevent distension of injured bowel. | (1) Prophylactic (during op.) Before gel. B.P. 106/70. 500 c.c. After gel. (given slowly—2¾ hrs.) 110/70. | After gel. (1), saline and glucose I.V. 2 pts. in 5 hrs. At finish, B.P. was 120/70. But soon after B.P. fell and post-op. shock evident. | (1) Potential operative (prophylactic treatment). Gelatin during op. and saline post-op. prevented any manifestations of shock while being given, both very slowly. Perhaps faster rate or larger amount wiser. |
| | | (2) Before gel. (2) B.P. 75/?. 500 c.c. in 3 hrs. 10 min. B.P. raised to 88/50. | After gel. (2), I.V. saline and glucose 1 pt. and I.M. saline and glucose 1 pt., in about 6 hrs. Maintained gel. response. | (2) Post-operative. (Probably initiated at time of peritoneal reaction to returned loop of damaged bowel). Appeared about 8 hrs. post-op. Response to gel. (2) good and well-maintained during and after further saline. |

TABLE 1—*Continued*

| *Data concerning patients: Series No., initials, age, sex, hosp. no., adm. and disch. dates, condition on discharge, diagnosis and complications.* | *Operation and other treatment. Blood pressure on adm. and pre-operative.* | *Gelatin solution: B.P. before gel. Amt. of gelatin. B.P. after gel. Remarks.* | *Other treatments for shock. Whether before or after gelatin. Amt. given. Response.* | *Type of shock. Comment on shock treatment.* |
|---|---|---|---|---|
| 18. V.P., 45, M, V-75830. 10-10-46 to 5-11-46. Cured. Doudenal ulcer—4 yrs. Pyloric stenosis—6 mths. Haematemesis, slight. Anaemia. Hb. 70%. Hookworm infestation. Emaciation. | Partial gastrectomy and pre-pyloric exclusion. Local anaesth. (1% Novocain) supplemented with intravenous Barbitone. Wangensteen suction 24 hrs. Hookworm treatment. Pre-op. B.P. 90/70. | Before gel. (during op. B.P. 110/70. 500 c.c. in 40 min. B.P. during giving 120/90. B.P. 4 hrs. after finish 105/75. | At beginning of op. & before gel. Saline and glucose I.V. 1 pt. Again, 4 hrs. after gel., at first sign of fall in B.P., saline and glucose I.V. 1 pt., followed by rectal saline & glucose, maintained good condition. | Potential operative. No shock developed in this case of gastric resection in man with 70% haemoglobin, in which it might be expected. Saline started with anaesthetic and gelatin given during most shocking part of op. Shock completely prevented. |
| 19. P.S., 25, M, V-75847. 11-10-46 to 1-12-46. Much improved. Appendicular abscess (onset of appendicitis 3 days bef. admission. Took purgative day bef. adm. Symptoms worse. Mass in lower abdomen). Extreme prostration on adm. | Drainage of abdominal abscess—12 days after adm. Wangensteen suction. Penicillin stopped after 1st 6 days when peritonitis seemed to have cleared. Next day pleural effusion. Aspirated. Temp. up again & peritonitis recurred. Penicillin and Sulphathiazole. B. P. on adm. not audible. After morphine 60/?. | Before gel. (1) 60/? 500 c.c. in 1 hr. 40 ms. After gel. B.P. 80/60. Prompt response to rapid giving of gel. but 20 mins. later B. P. 70/?. Came up with saline. Before gel. (2) B. P. 75/60. 500 c.c. in 3 hrs. Then B. P. 110/70. Effect maintained 1½ hr. later, 105/75. | After gel. (1) saline I.V. 1 pt. in 3 hrs. While running B.P. 85/60. Then saline I.M. 1 pt. B.P. fell slightly until gel. (2) given.<br>After gel. (2) on day after op. saline I.M. 2 pts. and on following day saline I.M. 3½ pts. and I.V. ½ pt. (I.V. saline was then giving chills). B.P. well maintained. | Peritonitic (infective) shock. Apparently increased by journey to hospital. Successfully treated by: (*a*) Immediate use of gel. and gel. repeated when B.P. fell again. (*b*) Adequate saline to provide salt and water. (*c*) Immobilisation of abdomen with morphine and reduction of distension with Wangensteen suction, continuous. (*d*) Control of peritonitis before benefit of shock treatment could wear off. (*e*) Delaying operative treatment until shock and infection under control. (*Cf.* Case 11.) |
| 20. T., 45, F, V-75592. 30-9-46 to 23-10-46. Died. Carcinoma of stomach. Symptoms 2 mths. only. X-ray—advanced ca. 2/3 of stomach pyloric obstruction, dilatation of oesophagus, metastases, glands near stomach. Anaemia. Hb. 46%. Emaciation. Hookworm infestation. | Palliative gastro-jejunostomy. Biopsy of gland. Local Anaes. Wangensteen suction post-op. 24 hrs. & again next day.<br>*Comment*: In this markedly emaciated and anaemic woman with advanced cancer it is amazing that operative shock or early post-op. shock did not appear, for no pre-op. preparation with I.V. fluids and only slow acting I.M. subcut. and rectal fluids during and after op. Local anaes. and gentle surgery helped prevent shock. | 5 days after op. before gel. B.P. not recordable. 1,000 c.c. in 3 hrs. then 80/60. Prompt improvement maintained for few hrs., then deterioration | At op. saline subcutan. 1 pt. After op. —same day—saline & glucose I.M. 1 pt. & that & next day, saline by rectum 6 oz. q. 8 h. Condition apparently fairly satisfactory.<br>After gel. started, Anacordone — question as to effect separate from gel. Saline and glucose I.V. 1 pt. Patient survived through night. Early morning Anacordone—no response. | Late post-operative—probably peritonitic shock. In favour of this late shock being of peritonitic type are: (1) marked distention not relieved by enema or gastric suction on day before severe shock. (2) Lack of maintained response to shock therapy. (5 days is within "weak period" for 00 chromic catgut used for anastomosis. Or cancer may have grown through and caused peritonitis.) A prompt and definite response in pulseless patient to use of gel. solution is characteristic; but as in many of cases with peritonitis, result not maintained. |
| 21. V.R., 60, F, H-574. 1-4-47 to 3-5-47. Improved. Gastro-intestinal function & nutrition. Carcinoma of stomach with metastases in liver, and pyloric obstruction. Anaemia. Hb. 50%. Syphilis (Kahn plus 1). | Palliative gastro-jejunostomy. Open drop chloroform anaes. Intensive pre-op. nutritional preparation— milk and eggs by frequent small feeds plus "Amigen" (protein digest). | B.P. readings not available. ½ hr. before op. 500 c.c. Condition good throughout op. | Preparation before op. Diet as indicated. During 4 pre-op. days saline sub-cut. or I. V. 1-2 pts. each day. Gradual general improvement. After gel. saline sub-pectoral 2 pts. Next day saline and glucose I.V. 2 pts. Condition remained good. | Potential operative or post-operative shock, satisfactorily prevented in anaemic and emaciated patient with inoperable cancer, even though blood and plasma not available. Only 500 c.c. gel. sol. given but apparently best time chosen—just before op. Its effect lasted through and after op. for post-op. saline was given by slowly absorbed sub-pectoral route. (*Cf.* case 20.) |

TABLE 1—*Continued*

| *Data concerning patients: Series No., initials, age, sex, hosp. no., adm. and disch. dates, condition on discharge, diagnosis and complications.* | *Operation and other treatment. Blood pressure on adm. and pre-operative.* | *Gelatin solution: B.P. before gel. Amt. of gelatin. B.P. after gel. Remarks.* | *Other treatments for shock Whether before or after gelatin. Amt. given. Response.* | *Type of shock. Comment on shock treatment.* |
|---|---|---|---|---|
| 22. J.R., 19, F, V-76003. 20-10-46 to 6-4-47. Improved & transferred back to sanatorium. Pulmonary tuberculosis, recognized 8 mo., had left artif. pneumothorax started in san. but A.P. impossible on right, where she has cavity. Referred here because of Tuberculosis, Rt. Kidney, with sec. Tb. Cystitis, 4 mo. During stay here, had three small haemorrhages. (Pulmonary). | Nephrectomy and partial ureterectomy (right). Local anaest. supplemented by intravenous A.P. (left) maintained during stay here. Preop. treatment for dysuria — large doses sod. citrat. until lung state allowed op. Anaemia Hb. 60%. Preop. B.P. 82/50. | After saline, during op. B.P. 75/50. 500 c.c. in 3 hrs. After gel. 86/50. Maintained B.P. at about same level till end of op. then slight rise. | Before gel. (at first part of op.) Saline I.V. 1 pt. Slight fall of B.P.<br>After gel. saline I.V. 2 pts. in 4 hours. Maintained B.P. fairly constant at post-gel. level. | Operative (slight). Prophylactic treatment. In hypotensive, anaemic patient with bilateral pulmonary Tb. who had had several small haemorrhages (right lung?). Saline at start of op., with gelatin given at first sign of fall in B.P. and followed by saline after op. prevented development of any signs of serious op. or post-op. shock. |
| 23. R.H., 35, F, V-61806. 19-12-46 to 16-2-47. Cured. Doudenal ulcer—1 yr. Pyloric obstruction, duration ? (vomiting 1 yr.). Anaemia, Hb 50%. High sedimentation rate (unexplained). | Med. treatment for more than a month pre-op. Gastro-jejunostomy. Preop. B.P. 90/60. | About 12 hrs. post-op. B.P. 75/50. 500 c.c. slowly in 5 hrs., then 85/50. Improvement well maintained. B.P. 5½ hrs. after gel. 84/58. | During 12 hrs. between op. in a.m. and gel. in p.m., Saline and glucose I.V. 2 or 3 pts. Slow gradual fall in B.P. until gel. given. | Post-operative (mild) shock in hypotensive patient. Developed during slow giving of saline and glucose. 500 c.c. gelatin sufficient to start upward trend again of B.P. No further I.V. fluid given. |
| 24. M., 45, M, V-77789. 29-1-47 (11 : 10 p.m.) to 30-1-47 (10 p.m.). Died. Doudenal ulcer—5 yrs. Perforation, 15 hrs., before adm., 18½ hrs., before operation. | Laparotomy and closure of perforation. Closed aether anaes. Wangensteen suction. Sulphanilamide powder locally in abdomen. On adm. pulse not palpable, B.P. not audible. | After saline and before gel. (1) B.P. 70/?. 500 c.c. in 1 hr. Then B.P. 100/70. | On adm. and before gel. (1) saline I.V. 2 pts. in 1¼ hrs. Pulse now felt, systolic B.P. up, but diastolic still?. After gel. (1) and before op. saline and glucose 1 pt. in 1 hrs. Seemed well enough to operate. No I.V. fluid during op. | (1) Peritonitic (ruptured ulcer). Response to saline I.V. followed by gelatin solution *given rapidly* as soon as patient admitted was prompt and seemed maintained with further saline and glucose so that operation undertaken. Unfortunately record does not show whether B.P. started down during or after end of operation. |
| | | (See next column). Before gel. (2) B.P. unobtainable. 500 c.c. in 2 hrs. then B.P. 78/60. Elevation in B.P. but gen. cond. same.<br>Before gel. (3) B.P. 86/65. 500 c.c. in 1½ hrs. B.P. maintained but no improvement in patient. | After op. and before gel. (2). Saline and glucose 1 pt. slowly. No record to show whether B.P. started down during op. or during saline. 2 hrs. after saline started, B.P. 80/60, 2½ hrs. later B.P. 78/60. 1 hr. later, B.P. not obtainable. After gel. (2) saline and glucose I.V. 3 pts. in 4½ hrs. Slight rise in B.P. After gel. (3) saline I.V. 3 pts. before patient died. | (2) Post-operative plus peritonitic. B.P. fell gradually during giving of saline until sudden fall 6 hrs. post-op., 2nd bottle gel. partially restored B.P. which was then maintained at hypotensive level. By further saline and gel. during next 10 hrs., then sudden drop before patient died. Questions arise as to whether gel. (2) and (3) might have been more effective if given during and immediately after op., and whether large doses of Penicillin might have changed outcome. |

TABLE 1—*Continued*

| *Data concerning patients: Series No., initials, age, sex, hosp. no., adm. and disch. dates, condition on discharge, diagnosis and complications.* | *Operation and other treatment. Blood and pre-operative. and pre-operative.* | *Gelatin solution: B.P. before gel. Amt. of gelatin. B.P. after gel. Remarks.* | *Other treatments for shock. Whether before or after gelatin. Amt. given. Response.* | *Type of shock. Comment on shock treatment.* |
|---|---|---|---|---|
| 25. C., 60, F, V-77267. 27-12-46 to 12-3-47. Improved. Carcinoma rt. breast. Lump noted 6 mths. Large fungating ulcer 2 months. (Staph., strept., & Vincent's organisms). Anaemia. Hb. 40%. Nearly 8 wks. post-op. developed strept. septicaemia. | Pre-op. Penicillin locally and by I.M. inj. Pre-op. male sex hormone. Radical mastectomy & bilateral oophorectomy. Open Aether anaes. Pre-op. B.P. 110/60. Septicaemia treated with sulphonamides and Penicillin. | Before gel. B.P. 110/80. 500 c.c. maintained good condition. Gelatin given in 1½ hrs. | After gel. saline and glucose I.V. 2 pts. in 3 hrs. then B.P. 110/70. 6 hrs. later 100/60. | Potential operative. Prophylactic treatment. In this old woman with Hb. 40% it was possible to do radical mastectomy and bilateral oophorectomy by careful attention to (1) pre-op. preparation as to diet and infection; (2) Haemostasis at op.; (3) Prevention of shock with gel. followed by saline and glucose. (Attempts to get blood donors had failed.) |
| 26. K., 40, F, V-77571. 10-1-47 (5-15 p.m.) to 10-1-47 (11-45 p.m.). Died. Intestinal obstruction, partial 1 mth., increased 15 days with pain, complete 3 days (severe vomiting). Large mass in lower abd. Anaemia & dehydration. | No operation. Morphine, Coramine Oxygen inhalation, Wangensteen suction. On adm. pulse very thin. B.P. not recordable. Resp. shallow. | Before gel. B.P. not obtainable. 500 c.c. in 2¼ hrs. No. improvement. | After gel. saline and glucose I.V. 2 pts. in 3 hrs. until death of patient. No improvement in pulse, B.P. or general condition. | Shock of intestinal obstruction and peritonitis (?). "Irreversible" stage. Failure to respond to both gel. and saline seems to indicate this as a case of irreversible shock since other cases of intestinal obstruction and peritonitis treated sooner have shown at least temporary response to gel. even though they later died of their infection. No response to Coramine. |
| 27. M.R.N., 30, M, V-77578. 13-1-47 (6 p.m.) to 14-1-47 (1-30 a.m.). Died. Intestinal obstruction with strangulation of bowel & peritonitis, (*or* Perforated peptic ulcer ?). Occasional pain in abd. for 6 mths. Colicky pain & no motion, 3 days. | No operation. Wangensteen suction. Morphine. Aspiration of 25 c.c. gelatinous smelly fluid from peritoneal cavity and instillation of penicillin. On adm. almost pulseless, B.P. not audible. | After morphine and before gel. (1) B.P. 50/?. 500 c.c. in 2 hrs. Then B.P. 88/40. Gel. (2) 500 c.c. in 1 hr. Then B.P. 88/50. Definite rise in B.P. after each bottle of gelatin. | After gel. (2) saline and glucose 2 pts. in 4 hrs, when patient died. Gradual failing of circulation during this time. | Shock of intestinal obstruction and peritonitis. Compare this case with case 26. In this case there was a definite initial satisfactory response to gelatin even though circulation later failed. It was therefore not irreversible shock at beginning of treatment. (Would more gelatin or more penicillin have changed final outcome?) |
| 28. G., 77, F, V-31002. 25-1-47 to 15-2-47. Improved. (Dressings of small raw area contd. in O.P.D. Follow-up will show whether Ca is cured). Carcinoma left breast with no palpable or discernible metastases. (Noted lump in breast only 3 wks. before adm.) Anaemia, mild. | Radical Mastectomy (left), Bilateral oophorectomy, and repair of old incisional hernia (Mc Burney incision with drainage some yrs. ago for ruptured appendix). General anaesthesia. (Later op. for skin grafting of raw area). Adm. B.P. 170/80. Pre-op. B.P. 140/90. (Early mobilization not delayed by post-op. diastolic hypotension. Patient walked on 4th day.) | During op. and before gel. B.P. 95/60. 500 c.c. in 1½ hrs. Then B.P. 130/70. Effect not fully maintained. (No fluid given immediately after gel.) 2 hrs. after gel. B.P. 90/40. So saline started. | 2 hrs. after gel., saline I.V. 1 pt. in about 2¼ hrs. While giving, B.P. rose to 140/70. Soon after stopping saline, B.P. began to fall slowly (in 1½ hrs.) to 104/50. 3¼ hrs. after stop of saline (1), blood 400 c.c. given, in ½ hr. After blood, B.P. 100/48. After another 1 pt. saline, in 2 hrs., B.P. 110/50. No further I.V. fluid. During next 2 days, B.P. varied between 140/60 and 120/50. | (1) Operative, and (2) post-operative shock. The first developed during very long op. on lady of 77. Temporary control with 500 c.c. gelatin sol. (It would probably have been wise more gel. at that time, or at least to give some saline immediately after gel.) The fall in B.P. 2 hrs. after gel. was counteracted by 1 pt. saline. But not long after this, B.P gradually fell (especially the diastolic) to a level which was not much altered by blood or later saline. But no further sign of shock and recovery was good. (Lack of fear, and complete co-operation and confidence on part of this retired compounder seemed to play definite part in successful recovery.) |

TABLE 1—*Continued*

| *Data concerning patients: Series no., initials, age, sex, hosp. no., adm. and disch. dates, condition on discharge, diagnosis and complications.* | *Operation and other treatment. Blood pressure on adm. and pre-operative.* | *Gelatin solution: B.P. before gel. Amt. of gelatin. B.P. after gel. Remarks.* | *Other treatments for shock. Whether before or after gelatin. Amt. given. Response.* | *Type of shock. Comment on shock treatment.* |
|---|---|---|---|---|
| 29. M., 16, F, V-77955. 12-2-47 to 1-3-47. Cured. Massive cystic hydronephrosis, with pyonephrosis, in a congenital right double kidney. (Patient had two separate kidneys and ureters on left side). Cystic mass noted only for 20 days, during which time it filled all right abd. and extended to left epigastrium. | Nephrectomy (rt.). Pre-op. B.P. 100/74. | 3 hrs. 40 min. after end of op. B.P. 84/40. Then gel. 500 c.c. in 2 hrs. After gel. B.P. 88/48. Slight rise in B.P. during gel. continued during following saline. | Before gel. Starting during op. and continued 3 hrs. 40 min. after op. saline I.V. 4 pints. B.P. at end of op. 110/70, dropped during saline to 84/40. Further saline after gel. brought B.P. to 96/60 by next morning after op. | Post-operative shock. This case demonstrates: (1) post-operative shock may develop despite adequate quantities of I.V. saline given at a good rate; and (2) this gradual development of post-operative shock may be arrested with even 1 bottle (500 c.c.) of gelatin sol. so that further upward progress in B.P. may occur. (Supply of gelatin solution very low when case treated, so only one bottle used. Prophylactic use of gelatin during and immediately after op. might presumably have prevented shock.) |
| 30 N.T., 55, F, V-77991. 12-2-47 to 23-4-47. Improved. (Follow-up will show whether Ca is cured Carcinoma left breast, with fungating ulcer of 6 mo. duration. Several small palpable axillary glands (Path. report—do not show ca, though main growth is Carcinoma simplex). Ulcer infected. Anaemia, Hb. 50%. Hookworm & trichomonas infestations. Post-op. developed amoebic dys. | Penicillin cream locally pre-op. and penicillin IM. post-op. Radical mastectomy (left) and bilateral oophorectomy. Intratracheal gas-oxygen & aether anaesth. Later skin grafting to raw areas. Treatment for amoebiasis, and hookworm later. Pre-op. B.P. 92/56. | B.P. before gel. 80/?. 500 c.c. in 2¼ hrs. 10 min. after start, B.P. 70/50. B.P. after gel. 98/50. Effect maintained during rest of op. and during saline given after gel. | Before gel. After induction of anaesth. at start of op. B.P. fell to 90/?. While saline I.V. 1 pt. was given, B.P. rose to 110/90, then gradually fell in 2 hrs. to 80/?. After gel. saline I.V. 2 pts. in 3 hrs. B.P. after this saline was 90/54, but fell to 74/40 during slow giving of next 1 pt. saline. But returned again several hours later, after another pt. saline, to pre-op. B.P. level. | Operative and post-operative shock. This patient had severe anaemia and arterial hypotension before op. At start of op. sudden fall of diastolic pressure to 0. Prompt response to rapidly given I.V. saline, but effect not well maintained. At second drop in B.P. gelatin given with immediate response which was maintained during rest of op. and with help of saline for 3 hrs. after. Saline only was given during afternoon and night because of short supply of gelatin. Although there was secondary moderate fall in B.P., pre-op. hypotensive level regained by next morning. Recovery good. |
| 31. K.B., 40, F, V-77966. 12-2-47 to 2-4-47. Improved. (Follow-up will show final result.) Carcinoma right breast-noted 6 mths. ago. Palpable glands in axilla, 3 mths., and now also in supraclavicular region. Pain (unexplained) in dorsal spine & left leg—x-ray negative. Anaemia, Hb. 70%. | Radial Mastectomy (right) and bilateral oophorectomy. Anaes. induced with ethyl chloride, and then open drop aether. Male sex hormone for 3 days pre-op. and again for 3 days 1 mo. later. Pre-op. B.P. 106/60. | 1½ hrs. after start of op. B.P. 90/?. Then gave gel. 1,000 c.c. in 1 hr. 50 min. After gel. B.P. 80/50. Elevation of B.P. and maintenance of good condition of patient during rest of op. | Before gel. B.P. after induction, 110/90, then 100/80 at start of op. 35 min. later, saline started with B.P. 90/70. 1 pt. saline I.V. in 45 min. but B.P. fell to 90/?. Immed. after gel. saline and glucose I.V. 3 pts. Interrupted and restarted (chill and fever). B.P. varied between 80/50 and 94/60. Another 2 pts. saline during night. Another chill and higher fever. Next morning B.P. 80/40, mouth feeding started q.3.h. | Operative shock and post-operative hypotension. Shock developed during first part of op.—B.P. fell to 90/0. B.P. elevated as gelatin was given, and op. continued. As in other breast cancer cases post-op. hypotensive state lasted for several days post-op. Possible relation to bilateral oophorectomy(?) But hypotension does not alter good recovery. No further I.V. saline after 1st 24 hrs. because of pyrogen reaction, which occurs after certain batches of solution prepared in the hospital. However, good response to gelatin, and this maintained (though at hypotensive level) by I.V. saline and glucose. |

TABLE 1—*Continued*

| *Data concerning patients: Series No., initials, age, sex, hosp. no., adm. and disch. dates, condition on discharge, diagnosis and complications.* | *Operation and other treatment. Blood pressure on adm. and pre-operative.* | *Gelatin solution: B.P. before gel. Amt. of gelatin B.P. after gel. Remarks.* | *Other treatments for shock. Whether before or after gelatin. Amt. given. Response.* | *Type of shock. Comment on shock treatment.* |
|---|---|---|---|---|
| 32. A.M., 35, M, V-79152. 17-4-47 to 9-5-47. Cured? (Possibility of recurrence, though path. report finds tumour benign.) Massive chondroma of left anterior chest wall. left chest and produced large external tumour. Duration 3 yrs. Dyspnoea 1 yr.; cough & pain in chest 8 dys. Anaemia, sl. Hb. 80%. Hookworm infest. | Excision of tumour, including parts of 4 ribs and part of sternum and evacuation of hydromucinous fluid from lower half of chest. Anaesth. Ind. ethyl chloride, then intratracheal gas-oxygen and aether, continued with intratracheal "Trilene". Penicillin into pleural cavity and I.M. Adm. B. P. 100/90. Pre-op. B.P. 110/90. | Gel. (1). Started 1 hr. post-op. B.P. before gel. 80/50. 500 c.c. in 1 hr. Then B.P. 100/66. Gel. (2). 500 c.c. given immediately after 2nd saline, and over period of 4 hrs. 20 min. B.P. fell at first, then gradually rose again. Effect maintained through night without further fluid. Gel. (3) 500 c.c. next morning to prevent any further drop. | Before gel. During op. Blood 400-500 c.c. Maintained B.P. (which had dropped to 90/60) during rest of op. despite some difficulties with resp. while tumour was being removed. Saline I.V. started 1 hr. post-op. and 1 pt. given in 3 hrs. B.P. dropped and stayed at 80/50. After gel. (1). Saline and glucose 1 pt. in 35 min. maintained B.P. 104/66. After gel. (3) saline and glucose 1¼ pts. | Post-operative shock (moderate). Readily controlled with gelatin 500 c.c., and recurrence prevented by additional gelatin and saline with glucose. It is of interest that effect of second bottle of gelatin was maintained throughout night without any additional fluid.<br><br>(This case to be reported in detail elsewhere.) |

## REPORT OF CASES

Unfortunately the records of the first 25 or 30 of our cases in Hanumakonda have not been available for detailed study and report at this time, due to changes of staff and methods of keeping the records since my transfer from there to Vellore. Also, we have had to eliminate some of the later case records because certain facts were not recorded in sufficient detail to make them clear as to the effects of treatment. In the main however, the 32 cases reported here are the most recent cases treated in our Vellore hospital, recorded consecutively, with a few of the recent Hanumakonda cases added to illustrate certain points. It will be noted that there is a predominance of operative and post-operative shock cases in the group. We have not been able to assign any of our medical staff exclusively to work on this research project. In the ordinary course of their work, the staff doctors keep more complete records as to blood pressure and progress notes on the operative cases in the surgical department. And several of them in this department have been able and willing to make the extra notes required. We have therefore used most of our very limited stock of the special gelatin solution for those cases on whom we could expect to get the most complete records.

The essential details concerning the 32 cases are given in Table 1. Analysis of results are in Tables 2 and 3. The amounts of parenteral fluids used are shown in Table 4. The effects of the gelatin solution on blood pressure in certain of the cases are shown in Figs. 1-4.

TABLE 2—SHOWING RESULTS OF TREATMENT

| | *Cases Recovered* | *Cases Died* |
|---|---|---|
| Potential shock prevented and final recovery ... ... ... | 4 | ... |
| Actual shock controlled and final recovery ... ... ... | 19 | ... |
| Temporary recovery or improvement from shock, but finally died (including 5 cases of death from peritonitic shock) ... ... | ... | 6 |
| Recovery from shock, but death from other cause (Cancer) ... | ... | 1 |
| Irreversible shock—no or very slight improvement in response to treatment ... ... ... | ... | 2 |
| Totals (32 cases in series) ... | 23 | 9 |

TABLE 3—SHOWING TYPES OF SHOCK TREATED AND RESULTS

| *Types of Shock* | *Cured* | *Temporarily improved but died* | *No improvement and death* | *Total* |
|---|---|---|---|---|
| Haemorrhagic ... ... | | 1 | ... | 1 |
| Haemorrhagic plus post-operative ... | 1 | ... | ... | 1 |
| Haemorrhagic plus peritonitis ... | ... | ... | 1 | 1 |
| Potential Operative ... | 4 | ... | ... | 4 |
| Operative ... | 6 | 1 | ... | 7 |
| Postoperative ... | 6 | ... | ... | 6 |
| Operative and postoperative ... | 3 | ... | ... | 3 |
| Peritonitic shock alone | 1 | 1 | 1 | 3 |
| Peritonitis & operative or postoperative ... | 1 | 4 | ... | 5 |
| Intestinal obstruction with peritonitis and postoperative ... | 1 | ... | ... | 1 |
| Totals ... | 23 | 7 | 2 | 32 |

TABLE 4—SHOWING AMOUNTS OF PARENTERAL FLUIDS INJECTED

| Gelatin sol. in bottles of 500 c.c. I.V. | | Saline, or saline and glucose in number of pints (Imperial) I.V. | | I.M. | | Sub-cutaneous | | Blood or Plasma | |
|---|---|---|---|---|---|---|---|---|---|
| No. Cases | No. Bottles | Cases | Pints | Cases | Pints | Cases | Pints | Cases | Amount |
| 19 | 1 | 6 | 1 | 2 | 1 | 1 | 1 | | Blood |
| 10 | 2 | 1 | 1½ | ... | ... | ... | ... | 1 | Amt.? |
| 3 | 3 | 8 | 2 | 1 | 2 | ... | ... | 1 | 350 c.c. |
| | | 3 | 3 | ... | ... | ... | ... | 2 | 400-500 c.c. |
| | | 1 | 3¼ | ... | ... | ... | ... | | Plasma |
| | | 2 | 4 | 1 | 4 | 1 | 4 | 1 | 250 c.c. |
| | | ... | ... | 1 | 4½ | ... | ... | | |
| | | 3 | 5 | | | | | | |
| | | 3 | 6 | | | | | | |
| | | 1 | 7 | | | | | | |
| | | 1 | 9 | | | | | | |
| | | 1 | 23 | | | | | | |

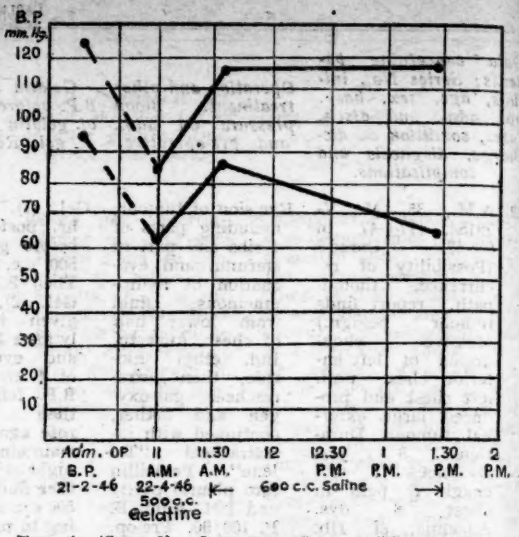


FIG. 1—(CASE 8). OPERATIVE SHOCK (MODERATE).

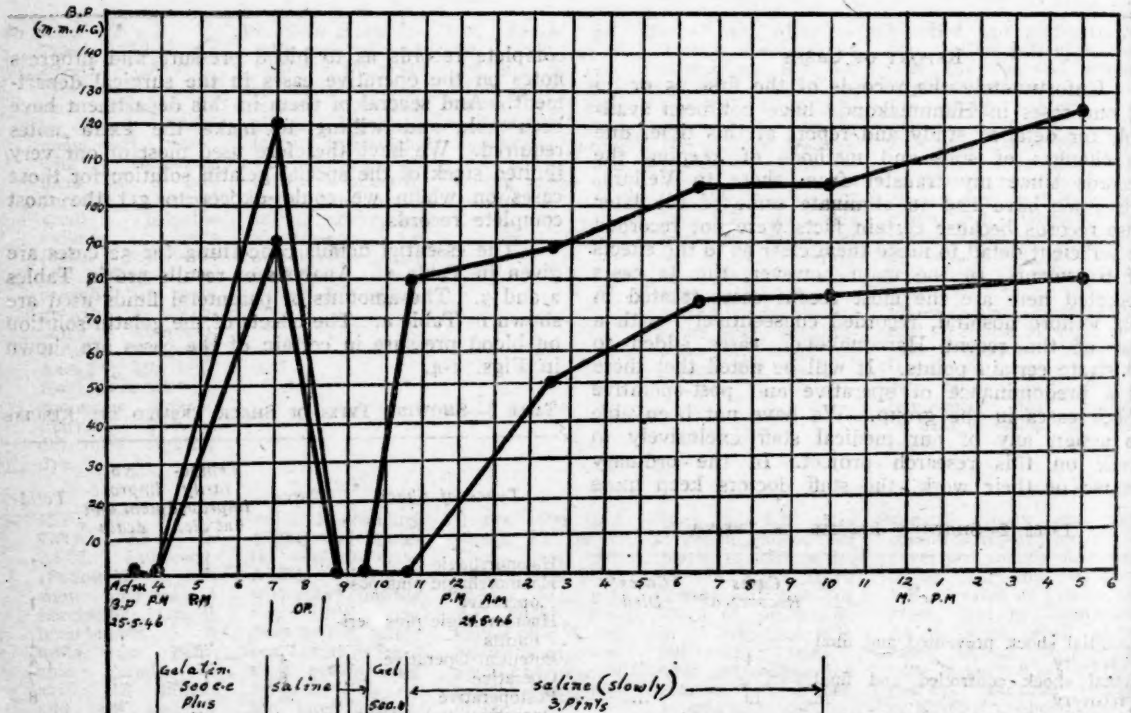


FIG. 2—(CASE 12). SHOCK OF INTESTINAL OBSTRUCTION AND POST-OPERATIVE SHOCK.

## COMMENT

Comment on the results of treatment in each case is made in Table 1. There are a few additional points which should be made.

Space does not permit us to report in detail the larger series of cases of shock of various types treated without gelatin, with which we have been comparing our results in the gelatin series. It is of course less possible to match identical cases in clini-

cal research than it would be in using litter mates in some animal experiments. There is however, that which may be called the weight of accumulated and cumulative clinical judgment which can be formed on the basis of the handling of a long series of patients and comparing them. This clinical judgment must be counted on, in addition to the study of graphs and laboratory reports.

In like manner, it is this weight of small facts and impressions which must answer the question that may be raised in connection with the prophylactic use of gelatin solutions:—"How do you know that that case would have developed shock if you had not given gelatin?" The answer must be that we cannot know for sure, but that by a study of the series of cases one can come to the conclusion

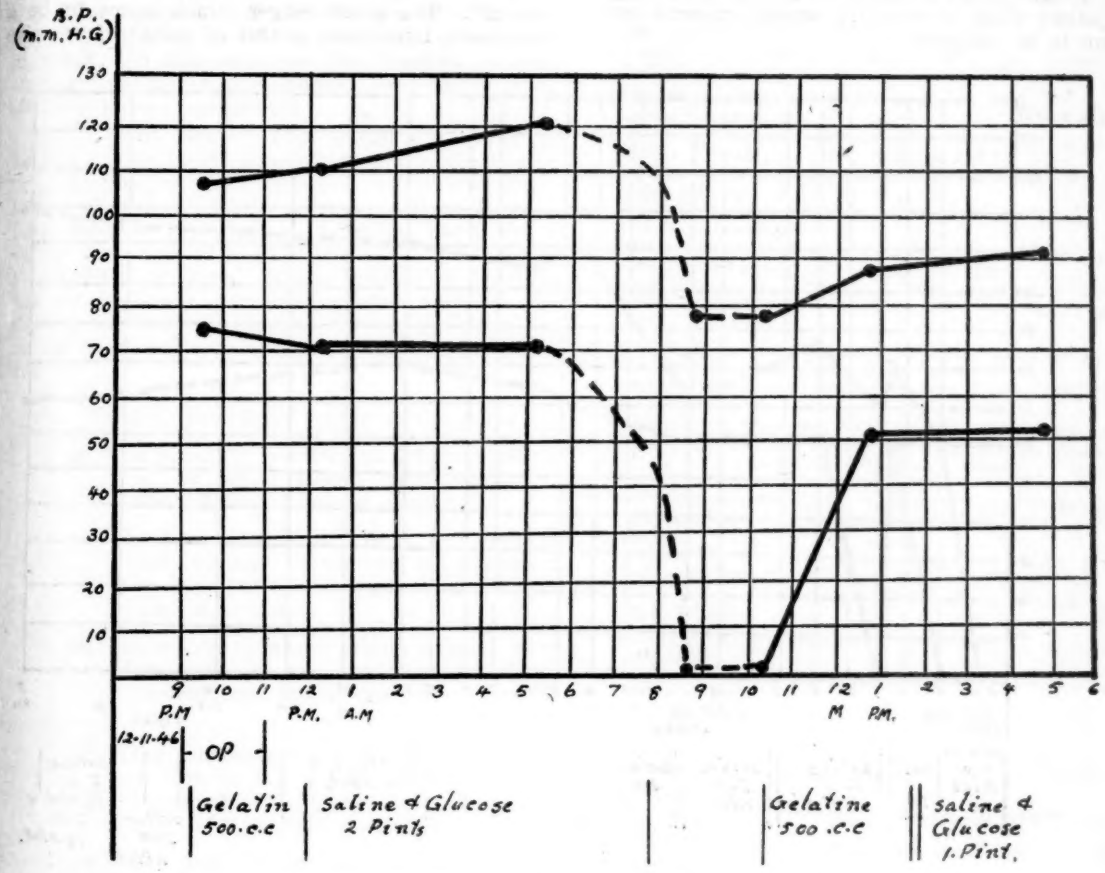


FIG. 3—(CASE 17). PROPHYLAXIS OF OPERATIVE SHOCK AND TREATMENT OF POST-OPERATVE SHOCK.

that certain cases would be very likely to develop shock. In such cases it is certainly better surgical judgment to prevent the possible shock than it is to wait to treat the well-developed shock.

It will be noted that several patients, either before operation or after, or both, had a rather marked hypotension, as judged by the usual standards. But since these standards of normal blood pressure are derived entirely from observations in Europe and America, we cannot say definitely that they apply in India. Several published reports and our own observations indicate that there are fairly large groups in the population of this country in which the usual blood pressure is low, by Western standards. It is difficult at times to know whether the low blood pressure reading on a patient is due to shock or is merely a record of his usual level of arterial tension, unless we happen to have a previous record of the patient. A reliable table of average blood pressures for the different parts of India, classified as to age, sex and certain other factors would be most valuable. For some years we have been collecting blood pressure readings of patients, students and other groups. We believe that similar collections by others, combined perhaps with statistics that might be gathered from the examination of recruits for the armed forces, might make the basis for building up tables which would represent adequate statistical sampling of the population. This would not only give us a "base-line" in our shock work, but would be useful in many ways.

The persistent hypotension of the breast cancer cases in the postoperative period is of interest. We do not know as yet whether this might be related to the removal of the ovaries, which we are using as a part of the treatment in these cases. But we can report that there was no delay in healing, early ambulation or generally satisfactory recovery in these patients. The observation of Page, Taylor and Kohlstaedt[63] that adequate tissue perfusion is more necessary than elevation of arterial pressure would seem to be relevant.

Although there are many cases in which blood transfusion seems still to be the method of choice, there has been added impetus to the search for satisfactory blood and plasma substitutes because of a number of dangers in blood transfusions which have only recently been emphasized. Much has been made of the Rh factor. A practical rule with regard to this is to avoid the use as donors of parous women and those who have received transfusions themselves[64]. The other danger which seems to be of increasing importance is that of spread of the virus

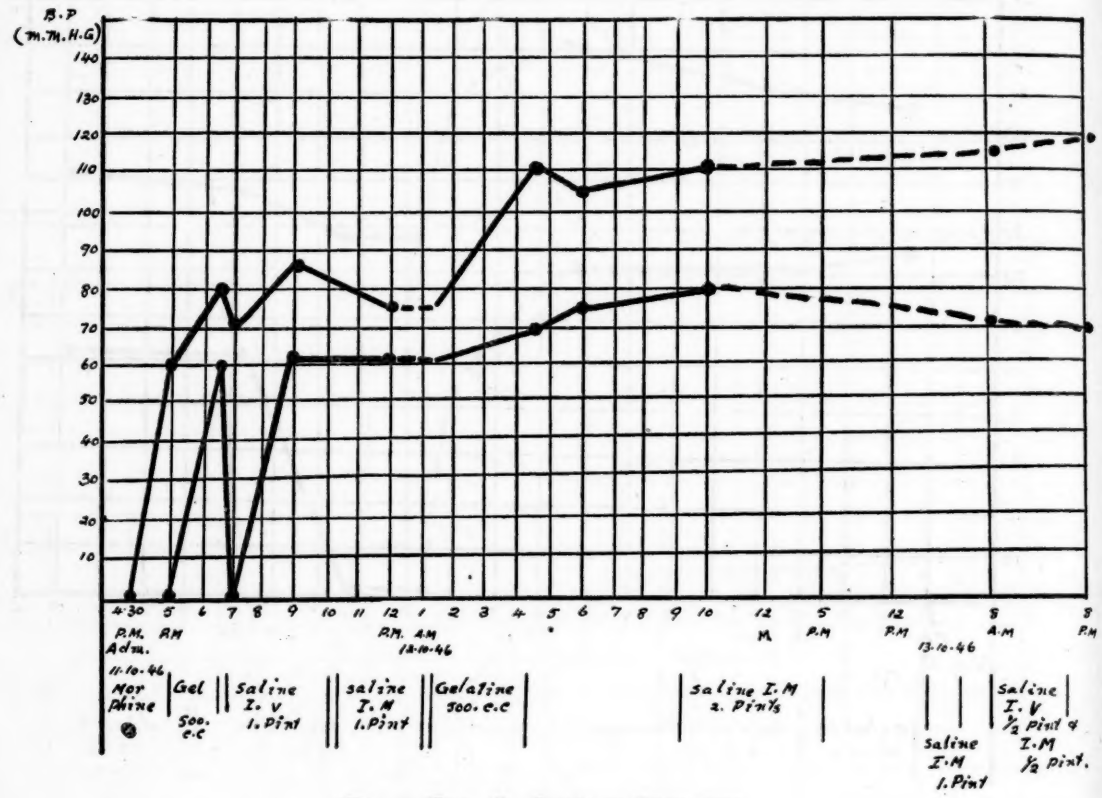


FIG. 4—(CASE 19). SHOCK OF PERITONITIS.

of infectious hepatitis[65]. The virus of this disease may apparently be present in the blood of a potential donor both before and for some weeks after he may show jaundice. It is advised that anyone who has had jaundice within a year should not be used as a blood donor.

We can expect to continue learning new things about shock before we will have found a completely ideal treatment for all cases. Pasqualini[66] has recently reported on the value of injections of vitamin C intraperitoneally in guinea pigs subjected to bleeding in the study of haemorrhagic shock. A large proportion of the animals receiving vitamin C survived under the conditions of the experiment, whereas most of those given an equivalent volume of saline died. In contrast with this use of pure vitamin C parenterally is the finding of Rosenthal *et al*[47] that oral feeding of fruit juices to their experimentally shocked mice was distinctly harmful. This was explained as being due to the high potassium content of the fruit juice.

## SUMMARY AND CONCLUSIONS

1. Specially prepared and processed ossein gelatin solution has been used in the treatment or prevention of various types of shock in over 80 cases, 32 of which are presented in detail in this paper.

2. This gelatin solution has been found to be very valuable in the treatment and prevention of shock.

3. Much better results can be obtained in the treatment or prevention of shock when gelatin solu-

tion is given in addition to the infusions of saline or saline and glucose than when the latter are used without gelatin.

4. Since we have had little blood plasma to use, our comparison of results is mostly between cases which received saline or saline and glucose alone and those which received gelatin solution in addition. The results with gelatin here compare favourably with the results reported by those workers who have compared gelatin with plasma and have found the two to be of approximately equal value in shock. In this sense we feel justified in concluding that the gelatin solution used by us is an effective plasma substitute.

5. Gelatin solution can be called a substitute for blood only in the sense that, and to the degree that, plasma may be called a blood substitute. Either plasma or gelatin solution may be successfully used in many cases of haemorrhagic shock during the phase of acute shock and while waiting to get blood to give. If the amount of bleeding has not been too great, the gelatin solution, like plasma, may make it possible for the patient to be carried over until he is able to replace his own blood loss.

6. Further research is needed to determine:—

(*a*) The optimum quantity of gelatin solution to use under various circumstances in the different types of shock.

(*b*) The best time at which to give gelatin solution may be used in the treatment of hypo-proteinaemic states which predispose to shock.

(*c*) The extent to which gelatin solution may be used in the treatment of hypo-proteinaemic states which predispose to shock.

(*d*) What combination of gelatin and saline will be best in the control of shock in intestinal obstruction without peritonitis, and in other types of shock.

(*e*) What combination of chemotherapy and shock therapy will be most effective in late cases of ruptured ulcer and other peritonitic states.

## Acknowledgment

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## THE DOCTOR AND THE AIR

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A simple notice in the Press recently recorded the fact that a young Indian medical officer had qualified as a pilot in the Royal Indian Air Force.

This was however more than a mere item of public news or interest but was indeed an epoch marking event since this young man was the first member of the medical profession in India to gain the coveted Air Force wings.

This incident leads one to reflect on what may be the future possibilities for Aviation Medicine in India, and what part the "young air-minded" doctor can usefully play in the service of his country and of his profession. It is not overlooked that flying is not confined to the Air Services of the Armed Forces, and that the aeroplane will play an ever-increasing part in speeding the civilian doctor to his patient, whether to the bedside of a prince or the focal point of a famine or disease ravaged area.

It is not likely that it will be the privilege of many Air Force doctors to have the honour and glory of wearing the wings on their tunics ; restrictions on the availability of training aircraft and the time of flying instructors are limiting factors, but no opportunity should be lost of gaining flying experience in other ways such as passenger flying in the various combat aircraft, or even a course of instruction at local flying clubs where it would be open to medical officers to qualify for the "A" and "B" flying licences as a spare-time pursuit.

There is no doubt that even from the purely sporting aspect, flying is a pastime which should have a great appeal for modern youth, whether instruction is undergone at the flying club or the more severely disciplined Air Force flying school. Flying training is a progression of enjoyable events for the pupil who has even a moderate degree of aptitude for the art. The first occasion of leaving the ground in a two seater dual control aircraft seated behind the instructor who is at the forward controls may be a somewhat bewildering experience ; the runway apparently travelling at high speed in a contrary direction is left behind and as the aeroplane gains height the pupil looks down on the chequer board pattern of the fields beneath and the toy proportions of trees and buildings ; his first two impressions are that with distance from the ground, the sensation of speed diminishes surprisingly and he is much relieved to find that even at 1,000 feet he has no feeling of the giddiness and insecurity he may have felt when perched on a 20 feet high wall in the more familiar world below, and which he apprehended might assail him in the air. After a few gentle turns in the course of which the pupil is glad to be aware that there is no danger of falling out of the machine, he begins to appreciate the relative sequences of ground, sky and horizon, to become "orientated" as they say, and the thrill of the new game mounts in his blood ; if presently the instructor invites him to "feel the stick" his state of bliss reaches a high level, and from that moment his career as a pilot may be said to have commenced.

Thereafter follows a succession of golden days in which the pupil must practise the difficult art of flying straight and level with the nose of the aircraft ever on the horizon ; then come the so-caled "gentle" turns in which only moderate bank or inclination of the wings are employed, followed by steeper turns, the loop and the spin and other acrobatic performances, a focal point of progress being reached when the pupil is allowed to make his own landings.

The unimaginative may find after the first thrill has worn off that there is something irksome and monotonous in the routine of training, but the keen pupil looks forward with growing excitement to the never-to-be-forgotten day when he will be allowed to make his first "solo" flight. It is indeed the

high peak of sporting adventure when at last the pupil speeds along the runway, alone in his machine for the first time. Now everything depends on his own skill and nerve. The take-off is not difficult; the training aeroplane is accustomed to take off almost on its own when it has gathered enough speed. Gradually gaining height, the budding aviator at length commences to circle the airfield by means of banks and turns which he hopes are precise and according to the book, careful to avoid any convulsive jerks of stick or rudder which faithfully translated by the wings or tail would betray his anxiety to critical watchers on the ground. Now comes the climax of his performance, the crucial test in comparison with which other manoeuvres are unimportant—the landing. As he glides down to the runway he is more actutely conscious than before that there is now no instructor's ready hand to snatch him from trouble at the last moment should he make a mistake. It is to the credit of our flying instructor's good judgment of a pupil's readiness for "solo" that it is a rare happening for a first "soloist" to make a serious mistake on landing. He may come in on the coveted "three-pointer" or with a few "bounces" that will be carefully counted by his fellow-pupils, but usually he comes safely to rest in a more or less orthodox manner; he has reached the "end of the beginning".

Not the least enjoyable part of a pupil's sojourn in a flying club or training school is the comradeship and friendly rivalry with his fellows; the endless discussions on the theory and practice of flight. speculation on whether the backward pupil "A" will ever make "solo". how many times did "B" bounce on his first "solo" landing; are "C" and "D" nervous types and is "E" inclined to be reckless? There are also of course the many games and diversions which are so essential to the full enjoyment, and the physical and moral development of youth, and have their own part in the day otherwise devoted to the practice of flying and the study of the theory of aeronautics and allied subjects. Eventually the students must disperse, whether to the advanced training schools of the Air Force where they evolve into fully fledged service pilots, or to commercial or civil flying, or to private flying. Whatever the ultimate goal may be of these fledglings from the various schools much of great value has been gained; to quote only two results: a contribution has been made to the total flying skill and experience of the nation, and many enduring friendships have been formed.

When considering the part that the flying doctor may play in the service of aviation one necessarily turns to the national Air Forces since, by the nature of their tasks and the specialized machines essential to the fulfilment of those tasks, there is here greater scope for the study and solution of the ever changing physiological problems that affect the man in the machine. The role of the Air Force Medical Officer, apart from his normal duties of the prevention and treatment of sickness, has two principal aspects, firstly, the day to day care of the flying personnel in his medical charge, and, secondly, the study of the physiological problems of flight.

In regard to the first aspect, it has to be remembered that, even in peace time, the flying of the modern high speed fighter and bomber aircraft is a very hazardous enterprise. The men who have graduated to the controls of these aircraft, whether as pilots, navigators or in other aircrew categories, are of a highly specialized type, of a high standard of physical fitness and mental alertness, their general make-up tuned, as it were, to harmonize with the velocity of the machines they manipulate. It is fair to say that they develop a certain volatile temperament peculiar to flying men of the fighting services; in popular language, they might be called "highly strung". It follows that to render the best service to such men, the medical officer must develop a real appreciation of their way of life, their environment, and the various problems, some significant, some apparently insignificant which may beset them, in order that he may be well armed to detect any deterioration in physical or mental performance, and take appropriate steps to counteract it, thus obviating a possible lengthy illness or a fatal breakdown at the outset of a promising flying career. To accomplish this, the medical officer must, as mentioned above, take all means open to him to gain air experience; he should join in the games and other pursuits of his flying companions whether on the station or farther afield; he should be much in evidence on the flying ground. In short, he should be as nearly as possible one of themselves. Much has been said in this connection on the "psychological care of flying personnel", but no abstruse psychological methods need be practised by the medical officer; if such were necessary, it would be matter for the higher specialists. The station doctors guiding principles should rather be tact and commonsense and a careful avoidance of undue intrusion where it may not be necessary nor welcome. This is the briefest outline of the doctor's ideal relationship to the flying men, but enough to suggest that much is required of him. One is confident, however, that the medial schools can turn out in abundance men qualified and eager to render such service.

In the second aspect, namely, the physiology of of flying, there lies great interest for the scientifically minded medical man. This covers a remarkably wide field and only a few points will be mentioned. There is an extremely close relationship between the medical scientist and the aeronautical expert which commences as early as the drawing board stage of the design of new combat aircraft. To take the cockpit for example, this is virtually built round the pilot by collaboration between these experts. The seat and access to controls are arranged to suit a pilot of average dimensions (many thousands of pilots have been measured to obtain averages in regard to leg length, body height, etc. and are then made adjustable to fit the undersize and outsizes. In this way, comfort and facility in handling the air craft, with resultant reduction of fatigue are obtained, and standards are determined which aid in the selection of members of aircrews of various categories. Again, in the matter of the cockpit panel, much study has been given to the placing of the various gauges (gadgets) so that

those most used by the pilot are in the optimum position of sequence and visibility ; special coloured lighting even has been arranged for the panel instruments to obtain maximum readability with minimum glare and ocular fatigue.

The foregoing may be more in the nature of physics and anatomics than of physiologics, but serves (very inadequately) to indicate the relationship of the medical researchist at the higher levels, to the aircraft designers. The vast field of physiological research cannot be referred to here ; the list of comprehensive investigations and reports is too long. Enough to say that more than 600 reports on medical aviation subjects were produced by the Flying Personnel Research Committee of the Royal Air Force during the 6 war years—1939 to 1945.

To revert to the Air Force Medical Officer. From the beginning he is introduced to the more elementary and immediate physiological problems which concern the airman in the routine day-to-day flying, and has access to the literature on more advanced subjects. The most interesting, probably the most important, and yet the most easily understood of these subjects, is the question of the relation of oxygen to altitude. For the study of this, there is available a very simple but highly valuable apparatus —the Decompression Chamber. By exhaustion of air from the chamber any atmospheric level can be simulated from the ground upwards to 40,000 feet, and the reactions of the occupants (flying personnel under test) to the progressive anoxic conditions can be studied. The range of information that can be obtained by tests of the physiological and phychological reactions to altitude in this way is very wide ; one item of many is the pre-selective differentiation between the pilot likely to give good performance at the comparatively low ceiling of the heavy bomber aircraft, and the pilot who can withstand the much higher operational level of the photographic reconnaissance aeroplane. Oxygen in relation to aviation has of course many other applications which space precludes from mention here.

Other subjects studied at the medical officer's first course include the effects of flight on the aural mechanism in respect to vibration, noise, altitude, etc., and the specific ear condition known as "Otitic Barotrauma" (aero otitis media) ; the relationship of the labyrinth to aerial orientation and equilibration, opening up the subjects of "Blind flying", "Air sickness", etc. Night visual acuity is also a large subject, its physiology, assessment in the individual, and the special training evolved for its improvement. Also there are the problems of "Velocity and Acce'leration"', the well known phenomenon of "Black out", and the remedies of special suits and modifications in cockpit seating and harness ; the comprehensive subject of "fatigue", its prevention or alleviation is also in the list. These are some of the principal subjects of the medical officer's first months, and when he has gained sufficient knowledge, it is his privilege to lecture the flying personnel at the flying school or squadron where he is stationed on the practical applications of these things to their daily flying routine. One of the more satisfactory jobs he may have from time to time is to supervise in the field experiments handed down by the higher scientists in the research institutes.

Such then is a brief sketch of the medical officer's earlier activities. He may remain for some 5-10 years alternating between flying schools and squadron stations, at times at the more prosaic depots or in junior posts at hospitals, and may then graduate to higher levels of specialism, professional or administrative. This is not to say that he will then be divorced from the physiological and other problems of flying. He will meet them again as a surgeon in the Ophthalmic, E.N.T., and Orthopaedic wards of the hospital ; in the laboratory ; as a Specialist in Medicine ; as an administrative officer supervising the work of his junior colleagues at the stations ; a few will have the good fortune to reach the research department, and it is open to all who may produce good "ideas" to have them examined, and if found valuable, exploited by the research workers.

As indicated earlier, not only the air forces fly, civil aviation has its problems too and is actively interested in such questions as pressurised cabins against the day when air liners will fly at stratosphere heights, and a question of immediate interest is that of the air conditioning of passenger cabins. A great many people already have experienced the furnace like state of the air liner cabin when it is at rest at the air terminus in the hot weather, the acute discomfort of high temperature and profuse perspiration while waiting to take off and the chilliness associated with evaporation of sweat as the aeroplane gains height. There is also a field for the development of light aeroplane flying for recreational and business purposes and the latter may well include the flying doctor or sanitarian on their rounds of far flung villages to visit outlying dispensaries to make malariological surveys, or cope with epidemic disease. There is little doubt that the greater satisfaction of flying are to be found with the lighter aircraft where the leisurely enjoyment of cloudscape and landscape is not marred by the thunderous roar of heavy engines as in combat aircraft and multi-engined air liners.

Fortunately in one sense none of the physiological problems of flying has reached finality. Stratosphere flight and supersonic speeds are almost with us today, and new lines of inquiry will continue to open up. Engineering, physics, chemistry, medicine, and allied sciences will all play their part, and as long as man is required to guide the machine, whether to battle, to arctic or tropical exploration, in transoceanic transportation, mountain survey, or other more ordinary pursuits of peace, it will be the aim of the scientific team to create conditions in which he can do so with a maximum of safety and efficiency and a minimum of fatigue.

It is a truism to say that the future is with youth, but easy to forecast that the future of youth will be largely in the air, particularly, in the wide air spaces of India whose climate and terrain lend themselves so happily to the "ups and downs" of flying. Romance and adventure are in the air and great opportunities of service. It is to be hoped that the medical youth of India will not neglect the opportunity now unfolding.

## *SPECIAL ARTICLE*

# ON THE INDIGENOUS SYSTEMS OF MEDICINE (AYURVEDA AND UNANI)

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### Introduction

We approach the subject, not in a spirit of aloofness or apathy but in a spirit of scientific study, in a frame of mind chastened by humility and actuated by the best interest of the people of the country from the point of medical relief. The indigenous system of medicine had its origin in this country in her days of ancient glory. It became by progressive stages of evolution the parent or progenitor of the modern scientific medicine by the aggregate contribution of scientific workers in different parts of the world. But that does not mean that the indigenous system of medicine, by its name and denomination alone, should be entitled to or carry with it the endorsement of science. This system like any other system of science should be examined and investigated, with an open mind, with a view to ascertaining its merit and utility, in the field of preventive and curative medicine in the light of the latest available knowledge and information of medical and allied sciences.

*The Yunani System.*—The word Yunani or Unani comes evidently from Ionia or Greece. It derives its origin from Greco-Syrian sources. The Bagdad and Basora schools of medicine made their contribution to the teaching of mediaeval Europe. The teaching went from there to the flourishing Tibia of the 14th and 15th centuries in Persia and Turkey. Both Greece and Rome owed a great deal of their knowledge of medicine to Buddhist preachers sent out by Chandragupta, Asoke and other Buddhist princes.

*Are they so many different systems?*—We hold the view that science. in medicine, as in every other sphere is one and undivided. As there is no indigenous system of Physics, Chemistry, or Astronomy nor an English, German or American system of them, so it stands to reason that there are not so many different systems of medicine.

### History

The word Veda is derived from the Sanskrit root 'Vid', which means 'to know', 'to judge', 'to learn', 'to gain'. It is analogous to the same Latin root 'Videre' 'to see'. Ayurveda or the study of 'Ayuh' or vital energy, longevity, the diseases, their prevention and cure, is said to have been derived from the Yayurveda and the Atharva Veda. According to legends, this vidya is said to have been transmitted in the following order—

From Brahma to Daksha the Prajapati, to the two Ashwinikumars—the two sons of the Sun God Surya, to Indra—the King of gods, to Bharadwaja—a learned human sage, a priest physician, who is said to have been the author of the 12th hymn of the 10th book of the Atharva-veda. Bharadwaja taught Atreya. Six pupils of Atreya, namely, Agnivesa, Vela, Jatukarna, Parasara, Harita, and Ksharpani wrote notes and compendia of his teachings. Of all these, only a single manuscript by Bhela and a work by Agnivesa exist. One of them 'thrice revised and recast' survives in skeleton and is known as the famous Charaka Samhita. It was edited by Charaka of Kashmir who left it unfinished, when he died, perhaps in the 2nd century A.D. This unfinished work was revised and completed by another Kashmir physician Drirhabala. The book so compounded is the celebrated Charaka-Samhita.

### Lost Literature

Not only the works of Jatukarna, Parashara, Harita and Ksharapani but other great works called Vishwamitra-Samhita, Ksharananda-Samhita, Kapilatantra, Gautam-tantra are apparently lost to us.

Alexander the Great's invasion in 327 B.C. was followed by the depredations caused by the Scythians and the Hunas in the 5th century A.D. The Saracens under Mahmud of Gazni over-ran the country in the 11th century A.D. (the sack of Somnath in 1025 A.D.). Valuable literary treasures were lost during these and subsequent invasions, particularly during the burning of the great manuscript library of Prithwiraj, the last Indian Emperor of India, by Muhammad Ghori (1192 A.D. Circ.).

### The Existing Literature of Ayurveda

Charak-Samhita has been mentioned already. The greatest name in Surgery is that of Dhanwantari of Benares. His pupils were Sushruta, Paushkalavata, Gopurarakshita, Bhoja, Bhaluki, Karavirya, Vaitarana. They have all passed into oblivion except for the fact that their names are referred to in old existing commentaries. The Sushruta Samhita is the only one of them, that survives to-day, as a revised and recompiled summary of the great original called Vriddha-Sushruta. The recompiler of Sushruta drew largely from a great work by Videha on the diseases of Eye, Ear, Nose and Throat but this as well as the large samhitas on the same subject by Nimi, Kankayana, Garga, and Galava, Chakkshushya, Satyaki, Saunaka, Karala, Krishnatreya, etc., live only in quotations.

*In Diseases of Children.*—The works of Jivaka, Parvataka, Hiranyaksha, etc., have not yet been found out.

*In Toxicology.*—The great samhitas of Alambayana, Usanas, Sanaka, Katyaana, etc., have not yet been traced.

*Rasayana and Vajikarana.*—In these two branches of Ayurvedic literature concerned with Hygiene, warding off of disease and senility and the preservation of sexual vigour in tact, the great works of Patanjali, Vyadhi, Vashistha, Mandabya, and Nagarjuna survive only in some quotations. They have been referred to by M. M. Kaviraj

Gananath Sen, M.A., L.M.S., in his introduction to Pratyaksha Shariram or an Anatomy in Sanskrit.

*Other Works.*—Next to Charaka and Sushruta, a third system of medicine was evolved by Vagbhata, the elder, a Buddhist of Kashmir, who lived in the 5th or 6th century A.D. Circ. He has left us the Ashtanga-Sangraha or the summary of the eight branches of Ayurveda, namely, Internal Medicine (Kaya-Chikitsa, Major Surgery (Salya-tantra), Minor Surgery (Salakya-tantra), Demonology (Bhuta-Vidya), Toxicology (Agada-tantra), Tonics (Rasayana), Aphrodisiacs (Vaji-karana), Paedotrophy (Kaumar-Bhritya, or nursing including nutrition and development of children).

Madhava wrote a pathology (Nidana) about the 7th century A.D.

Vagbhata, the younger, wrote a compendium in the 7th or 8th century known as the Ashtanga Hridaya Samdita, based upon the Ashtanga Samgraha of the elder Vagbhata.

The 4-great works of Ayurveda are therefore those of Charaka, Sushruta, Vagbhata and Madhaba.

Thereafter came the period of commentators—a period of nearly one thousand years—

Bhaskara Bhatta on Sushruta early 11th century.
Chakrapani Datta on Charaka late 11th century.
Dallana on Sushruta in the 12th century.
Aruna Datta on Vagbhata (younger) 13th century.
Vijay Rakshita, Shrikantha Datta and Vachaspati on Madhaba Nidana 13th century.

In the 16th century Bhaba Misra published a compilation from the older writers, which is called Bhaba-prakasha.

The history of Ayurvedic literature may therefore be divided into 3 epochs—

1. The first period of study and investigation as embodied in the 4 or 5 books available at present.
2. The second period in which, the knowledge so acquired was greatly lost, due to depredation and devastation by wreckless invaders.
3. The static period in which there were compilation ,revision and commentation.

After Bhaba Misra there has been hardly any progress at all, during the last 4 or more centuries.

## Catholicity and High Ideology

The catholocity and high ideology of Ayurveda are worthy of note.

Sushruta says—A physician experienced in his art but deficient in the knowledge of medicine is condemned by all good men as a quack and deserves punishment. So a physician was expected to keep abreast of all discoveries of medical science in order to render efficient succour to suffering humanity. He is enjoined to treat his patient as his own-begotten child. He defines medicine as that which-ever brings about a cure. He defines a physician as one who can deliver a patient from disease. Love of personal reputation and greed for lucre were countermanded. His only aim was to bring relief to suffering humanity. Drugs from all sources, native or foreign, having valuable therapeutic properties could be utilised and used, without any prejudice, such drugs as Rhubarb, Opium, Jamaica Sarsa, etc., are instances in point. Vagbhata says—Those who follow the recipes of books blindly and are not capable of reasoning their application should be condemned and looked upon as snares of death (M. M. Gananath Sen's translation).

*Interpolation.*—A great deal of effete material has also crept into mutilated Ayurvedic literature. They have to be weeded out and the texts carefully expurgated of them.

## The Spirit of Ayurveda

Although Ayurveda has remained where it was or has perhaps retrogressed during the last few centuries, the Spirit of Ayurveda is the spirit of acquiring knowledge, the spirit of progress.

It demands of you a spirit of investigation in quest of truth in order to add to the store of knowledge left by workers and authors of old. They borrowed liberally from foreigners. Even shepherds and cowherds knowing the identification of drugs and their properties were respected and utilised and not despised.

*Ayurveda of old.*—In her days of ancient glory, Ayurveda had many things in a more perfect condition than the same branch of science in any other part of the world. We may be pardonably proud of her past.

*Ayurveda of to-day.*—But, that should not make us close our eyes to the fact that Ayurveda at present has got no scientific surgery, midwifery, gynaecology, pediatrics, juris, hygiene, bacteriology or pathology. It has neither scientific anatomy, physiology and pharmacology nor physics, chemistry and biology. Unfortunately, therefore, but as a necessary corollary thereto the result has been devastating upon medicine as well. This medicine, for no fault of hers, has been left without properly fitting glasses to correct her visual errors. She is deprived of the third eye of knowledge, namely, the microscope, the X-rays, the endoscopes, and other '-scopes' and '-meters', '-grams,' and '-graphs' of later invention. And, as a result thereof, there is not a chapter of medicine nor the description of a single disease therein that can stand scientific scrutiny or can be studied or learnt for any utilisable purpose other than for an archaeological or historical one.

Loss of literature, interpolation of effete material, and the imparting of its teaching so far 'under the Tol system and the apprentice system combined' have left it very little which can establish its claim as a system that can be taught as a course in institutions and practised as a profession. What remains to-day, is a mass of mutilation, adulterated and interpolated, containing some time-honoured drugs and medicines and certain clinical aphorisms.

*A few instances.*—I shall cite a few instances to illustrate my point from Madhaba-Nidana, the only important work in Ayurveda devoted exclusively to pathology.

| *Subject* | *How treated* | *Total space allotted in lines* |
|---|---|---|
| All kinds of fever ... | As disease due to humoral upset (not as symptom-complex). | 173 |
| Anæmia and Jaundice | ,, | 49 |
| Convulsion, loss of conscience, coma. | ,, (plus trauma, dietetic error, mental causes). | 49 |
| Ascites ... ... | ,, (plus disorder of digestive fire, intestinal perforation). | 58 |
| Heart diseases (Hrid-roga). | ,, | 15 |
| Dropsy, oedema, anasarca (shotha). | ,, | 41 |
| All eye, ear, nose, throat, mouth, tongue, teeth and lips, diseases of. | ,, (plus dietetic error, trauma, worms, etc.). | 459 |
| Soft chancre, ulcers, including epithelioma of penis (Upadansha). | ,, (plus trauma, sexual excess, foul contact, worms, etc.). | 15 |
| Hernia (Scrotal), scrotal tumour, inflammation, elephantiasis, abscess etc. in which the scrotum is enlarged, swollen and painful are called together as Briddhi. | ,, (plus straining, carrying weight, etc.). | 21 |
| All fractures .... | treated together. | 25 |
| Syphilis (Firanga) ... (later addition) | due to sexual contact with infected Firingis. | 18 |
| Diseases of infants (Bala-roga). | due to humoral upset and to drinking vitiated milk. | 55 |

*Insanity* is considered into two different categories. One is insanity proper—a mental disease. The other is insanity due to possession by Supernatural bodies such as ghosts or Bhuta, gods or Devas, Asura, Gandharva, Jakksha, Ancestral Spirits (Pitrigraha), Reptile spirits (Naga-graha), Rakshasas, Pishachas, etc. As for the time of possession, the Devas prefer full moon, the Asuras,—the morning and evening twilights, the Gandharvas,—the Ashtami or the eighth lunar day, the Jakshah,—the Pratipada or the first lunar day, the Ancestral spirits,—the amabashya or the new moon, the Reptile spirits,—the fifth day of the moon, the Rakshasas prefer the night, and the Pishachas the fourteenth day of the moon.

Mantras, charms, amulets, jajnas for appeasement of planets, gods and spirits are widely used for treatment of diseases of Dystocia or difficult labour, and for preparing medicines.

## The Teaching of Ayurveda

There has cropped up insurmountable difficulty in the teaching of Ayurveda. Having been taught so long without any practical reference to anatomy, physiology, and pathology of the human body, the connotations of the technical terms used in the texts thousands of years ago, have lost their original meaning and have received various interpretations. So much so, that one authority fights with another to-day to establish his own point of view. This happens not occasionally, here and there, once or twice, but prevails and pervades all through, in respect of essential terms and terminology used throughout the 4 or 5 ancient text books that exist to-day and constitute the whole syllabus of Ayurveda, referred to above. I would refer here to the great controversy, that raged for 10 years from 1922 to 1931 and yet was never settled, between Pt. Gangadhar Shastri Joshi and M. M. Kaviraj Gananath Sen, M.A., L.M.S. of Calcutta, about the interpretation of the five fundamental terms as used by the ancients, namely, Kala, Peshi, Snayu, Shira, and Dhamani, which was embodied in an interesting pamphlet brought out by the latter entitled "Sanjna-panchaka-bimarsha".

Kj. Gananath characterised the existing text of Sushruta as "bristling with inaccuracies of ages" and in place of the old saying "Shareeray Sushrutah shresthah" or Sushruta is the best authority in Anatomy, went so far as to say "Shareeray Sushrutah nashtah" or Sushruta is good-for-nothing in Anatomy.

The scheme, recently submitted by Dr. M. N. Agashe, M.B.B.S., Sanchalak, Ayurveda Sansodhan Mandir, Satara, to the committee appointed by the Central Government for the upliftment of the indigenous system, contain informations which will help us to understand the position even better. Let me quote—"a large number of workers have devoted their time, money and energies to the cause of the indigenous system of medicine . . . nothing tangible had been achieved by the protagonists of these systems up to now."

It refers to the same ambiguity and difficulty in interpreting the ancient texts and suggests a sort of archaeological research work. Let me quote again,—"The intense study that one must give to them if one were to understand the implications and true meanings of what principally are,—(as was the necessity of the times when the texts were compiled)—aphorismal sayings".

His own confession of the impossibility of interpreting the old terminology will be evident from his own doubtful interrogations. Let me quote,—He asks, with several queries under teach term, the meanings of

Rasa—Plasma? tissue-fluid? C.S. fluid?
Meda—Fat? Red bone morrow?
Majja—Contents of bones? Brain?

*The Pancha Karma Chikitsa, viz.*, Snehan, Swedan, Vaman, Virechan, and Vasti have little to contribute to modern therapeutics, either in principle or in technique. Some are dangerous for want of modern knowledge of aseptic technique.

That it will be more a matter for research only than a subject suitable for teaching will be proved by further quotation from the same source.

"It is extremely important to recognise that because of the inevitable time-gaps, the science of Ayurveda has had periods of lost continuity . . . . commentators having interpreted the texts, as suited their own ideas . . . a great amount of confusion has therefore crept in, in the interpretation . . ."

He is of the opinion therefore that "unless this (*i.e.* interpretation) is done by authoritative groups of scholars, the present confusion must continue and the training of Ayurveda cannot be brought to a desirable uniform interpretation and standard".

All this leads to but one and only conclusion possible, namely that the 4 or 5 books of Ayurveda, as they exist to-day, can supply to us some drugs and theories for investigation and research but cannot be utilised as a system for standardised teaching.

In the same statement the Sanchalak, Ayurveda Sansodhan Mandir, says that in his institution he "treated a few cases in the strictly Ayurvedic way" and got 'encouraging' results, but he confessed, "We had no facilities to diagnose the diseases by laboratory or biological methods and it is quite important to do so before declaring that our results have been absolutely reliable".

He has suggested in the same scheme,—"The work of proper interpretation of the texts must be entrusted to scholars, who are themselves trained in the respective western science. The orthodox vaidyas may be having a legitimate pride about the sayings in the text, but they must be verified in the western way as early as possible". And 'to that extent' he has requisitioned the services of 'a chemical technologist, a botanist, a pathologist, and bacteriologist and a doctor with a preliminary training in Ayurveda'.

## Question of Reform

If any branch of Ayurvedic or Unani medicine is sought to be reformed in the light of modern knowledge, apparently enough, it will become the corresponding branch of modern medicine. Therefore the process should be reversed, that is whatever in Ayurveda or Unani stands the test of scientific scrutiny, should be absorbed and synthesised into modern scientific medicine. The process, which is rational, will be easy, economical, and efficient and will prevent the reduplication of teaching same or similar subjects in parallel institutions without any uniformity of standard.

## Efficiency of Medical Relief

Efficiency of medical relief cannot be sacrificed at the altar of cheap and half-hearted measures with a promiscuous intermingling of a little-of-everything kind of medical education on grounds of emotional nationalism. We should be accused of the worst form of tinkering in view of the fact that millions of people die in this country from preventible diseases alone.

## The Need of the Hour

These specific infectious diseases cannot be treated without an adequate knowledge of the etiopathology, the mode of transmission, the differential diagnosis, and the latest specific remedial measures. Science is not a provincial or even a national commodity. It belongs to humanity as a whole. So the tendency to separatism in science should be discouraged and resisted. Separate institutions for the modern scientific and the Ayurvedic and Unani systems would mean an enormous waste of men, materials and money, at a time when the country must produce at least 1,85,000 efficient medical men during the next 25 years to attain half the efficiency of public health administration in other civilised countries, according to the Bhore report.

Ayurvedic and Unani systems have both lost all other departments of medicine except Materia Medica and Medicine. As a practical and constructive suggestion, therefore, there should be only one uniform type of medical institutions, the modern ones, teaching modern scientific subjects according to the modern syllabus. In these institutions, there should be separate Ayurvedic and Unani wards, for treating patients who are willing to be treated under these systems. The facts and figures of these wards should be followed according to modern methods of study and statistics. The case-notes particularly those of all cured cases, should be handed over to the departments of pharmacology and therapeutics for their study. This will enrich the Indian pharmacopoeia and include all that is best in these systems and will have the effect of unifying these systems into one.

Chairs and stipends should be created for encouraging research in these systems in this manner, so that whatever material of worth may be salvaged therefrom may be absorbed into the corpus of scientific medicine, and utilised by the world.

The present promiscuous method of training in Ayurvedic and Unani schools, makes confusion worse confounded, and costs enormous expenses in men and money by reduplicating the very costly teaching of modern sciences in a substandard manner, with the result that the products of these institutions cannot be utilised for scientific medical relief in the service of the country. Accurate diagnosis is *sine quo non* for scientific treatment. This is a highly complicated process. It requires extensive scientific training for which there is no short-cut method.

Considering the poor health and high death-rate, as well as the ignorance and poverty of the Indian people, considering also the fact therefore that, Medical Planning for India must be as efficient and at the same time as economical as possible, India needs must concentrate all her efforts and pool all her resources to produce the medical personnel recommended by the Bhore Committee in the minimum possible time.

India should, therefore, emulate the example of China, Japan and Turkey, etc., and evolve one unified system of scientific medicine, enriched by a fusion and synthesis of all that is best in the

Ayurvedic, Unani and modern systems of medicine. India must not for emotional or national consideration revert or retrovert to mediaevalism, by discarding scientific outlook and scientific discipline.

"India being a poor country, can ill afford to have three systems of medicine running side by side, each having its own practitioners, hospitals and sanatoria, its laboratories and trained staff."

It is hoped that the reasons and suggestions outlined above will prove it conclusively that there is no reason why,—"the three systems cannot be combined into one all-comprehensive system", and will give the Government the answer for the question they put to the Chopra Committee in their inaugural address.

## APPENDIX A

COPY OF THE QUESTIONNAIRE NO. III CIRCULATED BY THE COMMITTEE APPOINTED BY THE GOVERNMENT OF INDIA ON INDIGENOUS SYSTEMS OF MEDICINE

*Questions*

1. What are the characteristics of the indigenous systems which specially commend them to the people?
2. What are the special features of the indigenous systems which give them a distinctive and pre-eminent value from the point of view of the health of the community?
3. Any special research on indigenous systems which you have carried out. Please supply copies of your research publications.
4. In addition to physical examination, are any laboratory tests or technique peculiar to the indigenous systems, used by you?
5. Are you in favour of any control over the teaching and practice of Indigenous Medicine on the lines of the control by the Indian Medical Council?
6. What measures would you suggest to increase the usefulness of the indigenous systems?
7. How can the measures suggested be made part of a comprehensive plan of medical relief?
8. How can the existing Vaidyas and Hakims be utilised, as an immediate measure, in any composite scheme of health service in rural areas?
9. What measures can be taken to improve the facilities for training in indigenous systems of medicine?

   Should there be a uniform standard of teaching and examination of these systems all over India?
10. Should the students of the western medicine be taught the indigenous system of medicine? If so, at what stage of their studies?
11. Are you in favour of evolving one system of medicine in India by a process of fusion of the Ayurvedic, Yunani and the Western systems? If so, what are your proposals?

## APPENDIX B

DRAFT QUESTIONNAIRE ISSUED BY THE I. M. A.—(PREPARED BY THE CENTRAL SUB-COMMITTEE ON INDIGENOUS SYSTEMS OF MEDICINE FOR THE MEMBERS OF THE MEDICAL PROFESSION)

*Questions*

1. What is your impression of Medicine as a Science?

   (*i*) Is it one and indivisible like Physics, Chemistry, Astronomy, etc.?

   (*ii*) Can it be divided into separate water-tight compartments as Ayurvedic, Unani, Modern Scientific and so forth?

   (*iii*) Is it possible to synthesise all these systems into an all-comprehensive system, into the corpus of which all available medical knowledge should be absorbed and thus a unified system evolved?

   (*iv*) Is not in your opinion the study of Physics, Chemistry, Biology, Anatomy, Physiology, Pharmacology, Pathology, Bacteriology, Radiology, etc., indispensable for the teaching of Medicine, whether it is called by Ayurvedic, Unani or any other name?

   (*v*) If so, do you not think that the teaching of these subjects in the schools and colleges of so many different and parallel systems would cause an enormous waste of men, materials, time and money?

   (*vi*) Are not these subjects actually taught in these Ayurvedic and Unani institutions in an apologetic and rudimentary form, which defeats the purpose for which they are meant?

   (*vii*) And as a result thereof, is it not a fact that the products of these institutions possess inadequate knowledge for scientific medical relief, preventive and curative?

   (*viii*) Can the country afford to wait, or waste its endeavours, when it must produce 1,85,000, fully qualified medical men, to attain even half the efficiency of medical aid provided for by other civilised countries, within the next 25 years, according to the Bhore Report?
2. In view of the fact that Medicine and Materia Medica are practically the only subjects, that are taught and practised by the Ayurvedic and Unani systems of the present day, all other

branches of medicine having passed into oblivion, do you think that their purpose would be best served if medical wards were set apart for them in modern medical colleges, in charge of Ayurvedic and Unani experts, to treat such patients as are willing to undergo treatment in these systems?

How would you like if facts and figures from these departments, especially from the case-notes of the cured patients, were followed up by modern methods of study and statistics, and the drugs and medicines used by those physicians were further examined pharmacologically and clinically, so that finally they might be added and incorporated into the Indian Pharmacopoeia?

Do you not think that India being a poor country, can ill afford to have 3 systems of medicine running side by side, each having its own practitioners, hospitals and sanatoria, its laboratories and trained staff?

Do you agree, therefore, in view of the reasons mentioned above, that there is no reason why the three systems cannot be combined, and amalgamated into a one all-comprehensive system?

What is your opinion of creating chairs and stipends in these colleges for competent workers of these systems, in order to salvage drugs and medicines from them, that might stand the scrutiny of scientific methods?

3. In view of the fact that other Asiatic countries, such as China, Japan, Turkey, etc., have solved similar problems in their respective countries, by bringing medical practice into one recognised and uniform system, do you not think that it is essential in the best interest of the country that there should be a fusion and synthesis of these systems into the modern scientific system as indicated above?

What other constructive suggestion can you make?

4. Do you consider that scientific research and standardisation of Indian drugs would materially help to popularise indigenous drugs and medicine, their utilization in schemes of Medical Relief, and their compilation in the Indian Pharmacopoeia?

What are your suggestions in this regard?

5. Are you agreed therefore that, as regards medical teaching there should be only one type of medical colleges, teaching all basic scientific preclinical and clinical subjects according to the modern syllabus, under the Indian Medical Council?

What are your suggestions?

6. Do you agree that in modern times, when Medicine has become an exact science, the well-being of a country and its people, is dependent on the cultivation of a scientific outlook and that it is fraught with the gravest consequences, if we choose for emotional, national or any other consideration to discard a scientific discipline and go back to the practice of the mediaeval ages?

7. Do you agree that scientific medicine is based on all available human knowledge, past or present indigenous or foreign and therefore all that is best in these systems may be absorbed and utilised to add to the fund of world-knowledge?

Do you know that these systems have made great contributions to medicine in the past, that already quite one-third of all the drugs in the official pharmacopoeia are indigenous, and that more and more are being tested added and rejected from day to day?

8. Do you agree that there can be no short-cuts to the acquisition of the requisite scientific knowledge for practising medicine and that therefore the training has to be prolonged laborious and expensive in order that it may be efficient?

Do you agree that producing practitioners, doctors, kavirajes and hakims, with varying degrees of doubtful competence is not only inimical to the advance of scientific medicine but dangerous to the health of the people?

9. Do you agree that the efficiency of medical aid depends necessarily upon (*i*) Diagnosis, *i.e.*, the determination of an etiopathological target, eliminating and differentiating diseases that might cause same or similar symptoms, and upon (*ii*) Treatment based upon choice of drugs as indicated and made available by the progress of science.

Do you agree that both of these depend upon a comprehensive clinical case-taking and sometime a complicated examination by X-rays and Laboratories?

Do you agree therefore that an apparently simple complaint such as, sore-throat, stiff-neck, mild fever for a few days, slight diarrhoea with blood, anaemia and weakness, etc., may be due to causes from most benign to most malignant and therefore should not be treated merely for cheapness, for the consolation of some treatment that may be available ready at hand?

Do you not think therefore that it is the fundamental duty of the Government to provide best medical aid for all people dissolving all barriers of poverty, ignorance, etc., at whatever cost necessary for the purpose?

What are your constructive suggestions for the Government to supply and for the people to demand?

In India where millions die every year from preventible diseases is it possible to practise any system of medicine without an adequate knowledge of the acute infectious diseases, their cause, transmission and treatment, to reduce death-rates and adopt preventive measures against Malaria, K.A., Tuberculosis, Dysenteries, Pneumonia, Diphtheria, Septicaemias, V.D., etc.?

10. How do you propose to utilise the existing Registered practitioners of the indigenous systems of medicine?

Do you consider it feasible to give them the privilege of a condensed course of medicine, for those who are willing and able to avail themselves of it, in mixed English and Indian languages if necessary, so that they may be utilised as practitioners possessing minimum registrable qualification during the period of transition when there is a great dearth of medical men? What other suggestions would you make in this regard?

11. In view of the fact that there have been long time-gaps, loss of continuity, mutilation, loss of literature, interpolation of unscientific and absurd materials, and effete matters into the text of these ancient books, and of the fact that these systems are being taught only theoretically from boks in the Tol system or the apprentice system, for more than a thousand years without reference to the objective details of the human body in health and the changes caused therein by disease and in view of that fact that it is very difficult (in some cases impossible or at most, speculative only) to interpret the meaning of such fundamental terms and terminology such as Shira, Dhamani, Kala, Peshi, Snayu, Rasa, Meda, Majja, etc., as used in the books thousands of years ago (during which period these systems became static and remained stagnant) as evidenced by raging controversy over them amongst their leaders and experts for the last 10 or 15 years,—do you think that these ancient works (whose number is about half a dozen only) can only be utilised for research by scholars and not for imparting a regular system of training?

12. What is your opinion of examination of a patient, for clinical case-taking by Ayurvedic and Unani practitioners?

Do you think that the various systems of the body, *viz.*, the Nervous, Circulatory, Respiratory, Gastro-intestinal, Urogenital, the Eye, Ear, Nose, Throat, etc., *are* or *can be* examined by Ayurvedic and Unani practitioners for interpretation of symptoms, differential diagnosis of diseases and for the management of diet and treatment in a scientific manner?

## CASE NOTE

## A CASE OF TYPHUS

UMAPADA KHAN, M.B.,
AND
DHIRENDRA NATH CHATTERJEE, M.B.,
*Carmichael Medical College Hospitals, Calcutta.*

Srutipado Chatterjee, Hindu male 23 years of age, was admitted on 16-7-46 for the following:

1. Continuous temperature with frontal headache and constipation for 10 days.
2. Rash all over the body for 6 days.

*Present Illness*—Ten days before admission he felt general malaise at night and on the next morning he had fever without any chill, the temperature rising to 101°F. The fever ran a continuous course, the maximum being 102°F and the minimum 101°F. He had intense frontal headache, constipation, cough with slight mucoid expectoration and sore throat right from the start. On the fourth day of his illness he had a rash all over the body, first noted in the morning on the flexor surface of the hands and forearms, by the evening practically covering the whole of the body, red in colour. There was no itching. After the eruption of the rash, the fever rose, maximum now being 104°F and minimum 103°F. He came under our observation on the 10th day of illness.

*Personal history*—A student living in the College Hostel. He went to his native place Kulti on vacation. He had been there for 12 days. He has many American, Negro and Punjabi friends at Kulti.

*Personal history*—Sufferer of sore throat for 2 years.

*Family history*—Nothing suggestive.

*General survey*—A young adult, tall, well-nourished with flushed face, injected conjunctivae, dry lips, rash all over the body—excepting the face. Fine tremor of the fingers present. Temperature—102·4°F; pulse—88 p.m. regular, V. T. moderate. respiration 28 p.m. regular.

*The rash*—Innumerable, symmetrical in distribution, present on the palms and soles. It is macular, of the size of small pea, copper coloured not disappearing on pressure. In the trunk and other parts of the body the rash was maculopapular, small in size with subcuticular mottling. Some macules had coalesced to form blotchy areas. In the face no rash was seen.

*Alimentary system and abdomen*—Subjective—constipation.

*On examination*—Tongue—red with thick greyish coat all over the dorsum, margin clean, dry, fine tremor.

Tonsils—fauces and pharynx congested. No rash was seen on the buccal mucous membrane.

Abdomen—not distended, full. No tenderness anywhere. spleen and liver not palpable. No gurgling in the right iliac fossa.

*Respiratory system*—Subjective—cough with slight mucoid expectoration.

On examination—Few scattered rales were found on both sides, front and back.

*Cardiovascular system*—Pulse—88 p.m., regular. V. & T.—moderate. B.P.—S/D=110/75 mm. Hg. Apex beat normal in position. Heart sounds normal.

*Nervous system*—Subjective—Insomnia 12 days; no delirium.

On examination—Memory and Intelligence—dull.

Superficial reflexes:

Abdominal reflex—exaggerated.

Others—normal.

Jerks—exaggerated.

Plantar reflex—normal.

*Blood examination*—On 10th day of illness—

Hb.—80% (Sahli); R.B.C.—4 mil.; W.B.C.—12,000. poly. 80%; lympho. 18%; mono. 2%.

*Urine examination*—10th day of illness

Colour—reddish brown; sp. gr.—1012; reaction—acid; albumin—++; no casts, no R.B.C. found.

*Blood culture*—On 10th day of illness—No growth.

*Urine culture*—On 10th day of illness showed growth of few colonies of B. Coli. *Widal reaction*—On 10th day of illness negative in all dilutions against B. typhosus, Para A and Para B.

*W.R.* (on 11th day of illness)—doubtful.

*Kahn*—weakly positive.

Blood calcium (on 11th day)—11·6%.

*Weil Felix Test* (on 12th day)—Positive against B. proteus OX19—1 in 40; against B. Proteus OXK 1: 80.

*Guineapig inoculation test* (on 12th day)—5 c.c. citrated blood was injected intraperitoneally into a guineapig which did not show any febrile reaction or testicular swelling in 12 days.

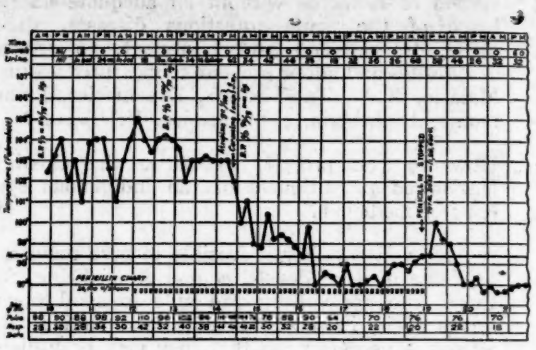
*Course*—The patient became comatose on the 11th day of illness; he had retention of urine, low muttering delirium, fine tremors of the fingers and tongue; on the 12th day the rash began to fade.

On the 13th day musty smell was detected emanating from the body of the patient.

The coma passed off on the 14th day. He was mentally alert and he could freely pass urine.

On the 15th day, the rash over the trunk and extremities disappeared completely leaving brownish pigmentation, the macules on the palms and soles persisting. The musty smell could no more be perceived.

The blood pressure came down to S/d=90/65 mm. Hg. The temperature showed a pseudo-crisis on the 15th day and came down to normal on the 17th day by rapid lysis.



Temperature Chart of Case Reported

The convalescence was uneventful excepting a rise of temperature to 100°F on the 19th day and to 99°F on 24th day. The macules on the palm and sole disappeared on the 17th day leaving copper coloured pigmented areas. The pigmentations gradually disappeared and could no longer be seen on the 26th day.

*Treatment*—During the febrile period—

*Diet*: He was given barley water, glucose and plain water by mouth.

*Drugs*: Alkali mixture by mouth thrice daily. Glucose intravenously 25% 75 c.c. twice daily. Penicillin Sod. from 12th day of illness 20,000 units I.M. every 3 hrs. Total dose given upto the 19th day being 11,20,000 units.

Symptomatic measures as and when necessary.

*Laboratory examination in the convalescent stage*—On the 24th day of illness—Widal reaction negative in all dilutions against B. typhus, Para A and Para B.

W. R. and Kahn—negative.

On the 28th day of illness—

*Weil Felix reaction*—Positive against B. proteus OX 19 1 in 250, negative in all dilutions against B. proteus OX K and OX 2.

*Discussion*—A case of typhus diagnosed clinically on the 10th day of illness (when he first came under our observation), confirmed later by laboratory investigation; the guineapig inoculation test was negative in this case (although only citrated blood was used and not clotted blood); was treated with penicillin and showed uneventful recovery.

We express our sincere obligations to Dr. Harihar Ganguli, M.D. (CAL.), our Visiting Physician, for permitting us to publish the case and correcting the notes. We are also gratefcl to Dr. K. D. Chatterjee, M.D., Visiting Physician, C.M.C.H. and Dr. A. Chowdhury, M.B., D.T.M., Pathologist, C.M.C.H., in helping us to conduct the pathological investigations of the case.

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## THE JOURNAL AND THE MISCELLANY*

The *Miscellany* was started about 15 years ago as a monthly journal of the Trichinopoly branch of the Indian Medical Association. After a short period of suspension, it appears again as the official journal of the South Indian Provincial Branch of the Indian Medical Association.

On its youthful sixteenth year blessings and good wishes have poured in freely from the leading members of the Association. These cover the first four pages. It contains one article followed by extracts of current medical literature and association notes. The association notes cover ten pages out of a total of twenty three pages of this issue. Provincial and local branches have recently been permitted to publish their own journals or bulletins in addition to the *Journal of the I.M.A.* For organisational reasons such an endeavour will be appreciated by the local medical men. Local activities appearing in print may stimulate some doctors to join the Association. But this is not all. The I.M.A. at the centre and provincial head quarters must increasingly make its presence felt by constructive work and suggestions in order to improve the health of the country. At the same time the integrity, freedom and interest of the medical profession should also be zealously guarded. When the profession feels that its honour is safe in the hands of the Association, membership is sure to rise. It is gratifying to note that the I.M.A. has been successful in this task. Naturally the membership has doubled during the last seven years.

With new developments in the political field during the recent months, another heavy responsibility has fallen on the shoulders of the I.M.A. This is as important as the question of organisation. We mean the raising of the standard of its medical journals. Let us admit that our journals look pale when compared with other well known foreign journals. The reason is not far to seek. The standard of a journal mainly depends on the nature of the contributions received. While some contributions are undoubtedly of high order, others are definitely poor. The poverty does not lie in the intrinsic knowledge of the contributor. It is in the presentation. Factual data are omitted, the presentation is without any graphs, charts or histograms in order to bring home the arguments made in the text. In most of such cases these data are available in the case book of the contributor. With practice and patience these defects will be corrected but the necessity of such a procedure should not be overlooked.

The *Journal of the I.M.A.* had to pass through a period of difficult five years. Being published from a place which was daily threatened with air attacks in 1942, it halted and faltered in its regularity. Scarcity of paper added to the difficulty of its regular publication. With the war over, everybody looked forward to a period of peace and prosperity. But the last twelve months had been far worse than the experience of World War II. The danger on the highways, lack of right men for printing and binding, irregular office hours, and above all the disturbed mind, put a further brake in its journey. The paper position has not yet improved. But we are determined to overcome all these obstacles as soon as possible in the new atmosphere of freedom. Work can only progress when the atmosphere is peaceful. If there had been defects in the past these will be remedied. With the Paper Control Order removed the number of pages of the Journal can be increased and as such activities of the different branches can be printed in further detail. For this purpose only, the publication of a periodical like the *Miscellany* by a provincial branch of the I.M.A. is hardly necessary. In the parent *Journal* one can compare side by side the activities of the branches separated by hundreds of miles. This comparison will bring better organisational efforts, competition and respect for one another. It must also be understood that otherwise perochialism or sectionalism may raise its ugly head, signs of which are, unfortunately, already visible here and there.

*The Journal of the Indian Medical Association* invites all sorts of articles, case notes from the profession for publication. Before sending such contributions, contributors are requested to consult some previous issues of the Journal and compare these with their own. If they are satisfied, that the article compares favourably, they are to send it. It is almost certain that these will be seen in print quickly. Otherwise, there is chance of delay because of the correspondence which follows between the editorial department and the contributors.

We think the Working Committee by permitting the branches to publish journals, have taken a wise decision. But this opportunity should be more profitably used to raise the standard of medicine in a free country. We suggest that such publications should be on the specialised line whenever possible. The I.M.A. should publish monthly, quarterly or even half yearly journals on Diseases of Children, Neurology and Psychiatry, Obstetrics and Gynaecology, Anaesthesia, Aviation Medicine, Public Health, etc. This work can be taken up by the Provincial Headquarters. We think there is a demand for such publication. With the backing of the profession and help of the teaching staff of the different medical institutions, such publications are

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sure to be successful. There is no dearth of clinical material or talents in this country and we want to use them now. We hope our suggestion will receive careful consideration of the profession.

We welcome *Miscellany* in our midst and wish it every success.

## INTERNATIONAL CONGRESS OF OBSTETRICS & GYNAECOLOGY, DUBLIN

The International Congress of Obstetrics and Gynaecology was held in Dublin this year in connection with the Bi-Centenary celebration of the Rotunda Hospital. The latter was to have taken place in 1945 but was held up on account of the World War. The Congress also could not be called for the same reason.

The Committee for the Inauguration of the Congress sent out a general invitation through the medical press to all medical men interested in this speciality. No special invitation was sent to practitioners in India through the Obstetrical Societies. The Congress was, however, attended by many prominent obstetricians and gynaecologists from many parts of the world. Some of them offered to read papers on the subjects selected for discussion in the Congress. Their offers were accepted. Two Professors from a Calcutta College read papers and took part in the discussions that followed. A retired Professor of one Medical College of Calcutta was elected a Vice-Chairman of one of the Sectional Meetings.

The Congress was in session from the 7th of July to the 11th of July. The first day opened with a Church Service in memory of Bartholomew Mosse, the founder of the Rotunda Hospital. After the Service the gentlemen and ladies attending the Congress met in the hall of the Irish College of Surgeons, St. Stephen's Square, Dublin. After an official reception by the President of Eire, the first session was held. There was a narration of the History of Obstetric Medicine in Ireland and the life of Bartholomew Mosse and his work in connection with the establishment of the Rotunda. On subsequent sessions there were discussions on 1. Puerperal Infections, 2. Obstetric Shock, 3. Eclampsia, 4. Sterility and 5. Maternity and Child Welfare. In addition to these, every evening there were social functions, *viz.*, reception by the President of the Irish Royal College of Physicians, sherry party by the President of Eire at the Phoenix Park Palace, a Congress Dinner by contribution, a garden party on the grounds of the Rotunda by the Master and a theatrical show on the last day.

The Dublin Doctors and Officials were particularly hospitable in every way. Adequate arrangements were made to house the visitors. The programme, however was much too crowded as is usual in such functions. If one wanted to attend the scientific section he could not visit the hospitals, for want of time. The social functions were held at different places and for want of suitable conveyances and because of the whimsical weather conditions at Dublin it was not feasible to make the most of the entertainments so thoughtfully provided for. Every one fully appreciated the opportunity of freely meeting and associating with prominent men of the profession from America and other parts of the world as also with politicians like Mr. De Valera and the President of Eire. The scientific discussions were much appreciated, though one must admit they were not of a remarkably high order. The arrangement as to the time allotted to each lecturer was justifiably criticised by a colleague from India. The acoustic arangements as also that of recording the lectures were good. There was an exhibition of medical and surgical appliances. This was a neat little show. But it was a show only. Most of the exhibits could not be had at short notice. This was perhaps due to the irregular conditions of world trade after the war. The conditions of travel to and from Dublin were a source of annoyance and discomfort to most of the visitors. The Congress was held at a time when there is always a rush on shipping and railways between Eire and the U.K. The Congress authorities did not undertake to help the visitors to arrange for their travel to and from Dublin.

On the whole most of the visitors feel they are greatly benefited by attending the Congress. Besides the two gentlemen who read papers there were altogether 18 doctors from India. When in future, travel conditions will improve, those should be able attend future world conventions to derive educational and social benefit. We may further hope that our Country will also be the venue of such conferences in the near future. This will give us the opportunity of extending our hospitality to our colleagues abroad in the Medical and Scientific lines.

# CURRENT MEDICAL LITERATURE

## Psychosomatic Factors in Gastroduodenal Disease

The peculiar periodicity and intermissions of episodes of gastric distress and of open gastroduodenal ulcerations and their relation to mental stress have been known for a long time, and have been repeatedly commented upon and emphasized. This undoubted psychosomatic relationship has made many clinicians believe that there is a distinct behaviour pattern common to these patients. The mental stress takes the form of an unrecognized subconscious conflict between the conscious desire to be an efficient, active, dynamic, and productive leader, assuming the responsibilities of other people's dependence upon him; and the very contrary unconscious desire to be taken care of, to be helped, and to be relieved of responsibility and of the necessity of making decisions. The following personality traits are easily noted and are stressed by most observers; tenseness; unusual and, perhaps, ineffectual drive; continuous nervous haste with the tendency to non-completion of any task; an unrealizable compensatory tendency to be self-sufficient, independent, distant and, perhaps, critical and obstinate; individualism; tendency to be overly conscientious and painstaking in performing ordinary duties but not consistently profound; tendency to worry continually but to repress outward signs of emotion; hypersensitivity; and of a peculiar instability withal. Bockus estimated that 50 per cent of ulcer patients have these mental characteristics, which constitute an hereditary psychosomatic pattern in which the diencephalon, autonomic nervous system and endocrine glands are equally concerned. It is not too much to say that in dyspeptic subjects without demonstrable open ulcerations this proportion is much larger.

One could almost conclude that for these people a neuropsychiatrist is as necessary as their attendant gastroenterologist. (Ed.—*Rev. Gastenterol.*, **14**: 415, 1947).

## Coarctation of Aorta

Reifenstein and others (*Am. Heart J.*, **33**: 146, 1947) write that a series of 104 autopsied cases of moderate, extreme, or complete degrees of the "adult" type of coarctation of the aorta in patients 2 years of age or older, which have been reported since Abbott's review in 1928, has been reviewed. As a result of this study, the following conclusions are presented:

Although coarctation occasionally was compatible with long life, at least 61 per cent of the patients died before or during their fortieth year of life, the average age at death being 35·0 years. The lesion was more common in males.

The causes of death and their frequencies were as follows: incidental causes, 26 per cent; rupture of the aorta (most commonly the ascending portion), 23 per cent; bacterial endocarditis or aortitis, 22 per cent; congestive failure, 18 per cent; and intracranial lesion (exclusive of embolism from bacterial endocarditis) 11 per cent.

Rupture of the aorta or an intracranial lesion accounted for one-third of all deaths. These accidents occurred mainly in the second and third decades of life. The commonest cause of an intracranial lesion was rupture of an arterial aneurysm, probably congenital, which produced subarachnoid hemorrhage. Survival rarely occurred after either type of rupture.

Bacterial endocarditis or aortitis occurred throughout the first five decades of life, most commonly was due to alpha streptococci, and most often (61 per cent) was associated with a bicuspid aortic valve, apparently congenital. Bacterial aortitis was found just distal to the coarctation or in the ascending aorta.

Congestive failure was common, but almost all patients who died of this cause had evidence of additional cardiovascular burdens, chiefly marked chronic valvular disease. Despite such handicaps, these patients sometimes lived for surprisingly long periods. Their ages at death corresponded to the ages at death of patients dying from valvular disease with congestive failure.

Bicuspid aortic valves were by far the commonest congenital anomaly associated with coarctation. This anomaly was present in 42 per cent of the cases in this series, particularly in cases with bacterial endocarditis (71 per cent). They frequently appeared to have been the site of previous rheumatic inflammation.

Cardiac hypertrophy was the rule. Dilation of the aorta was very common, especially in the ascending aorta, and occasionally proximal or distal to the coarctation.

The degree of coarctation appeared to be related to the extent of collateral arterial development and the frequency of antemortem diagnosis, which was 40 per cent in this series, in contrast to 14 per cent in Abbott's series. The various signs and symptoms which apparently depend on this collateral circulation are discussed.

A systolic murmur of moderate intensity (Grade 2 to 3) occurs in coarctation. It is present characteristically over the upper precordium and in the left interscapular region and is generally almost as loud in the back as anteriorly. Certain observations are presented which suggest that this systolic murmur is due mainly to stenosis of the aorta at the site of the coarctation. A diastolic murmur was not noted in uncomplicated coarctation; when present, it indicated an additional aortic, or less commonly, mitral, lesion, or associated patency of the ductus arteriosus.

The cardinal features of coarctation include (*a*) hypertension of the upper extremities (frequently not marked), (*b*) lower blood pressure of the legs (such as absent femoral pulses), (*c*) collateral arterial anastomoses (with rib erosion by x-ray), (*d*) the systolic murmur (which may be noted shortly after birth), and (*e*) cardiac hypertrophy.

Coarctation of the aorta, although not common, would be diagnosed as early as possible, for it is likely that surgery would be more feasible at that time than later when the aortic wall has become thinned and dilated. When resection of the area of coarctation with anastomosis of the cut ends of the aorta is not feasible, surgical treatment of the associated hypertension may be of value in certain cases, perhaps in patients beyond 15 to 20 years of age. This procedure has been performed in a small series of patients to date. The use of artificial vascular channels may increase the number of future cures of coarctation. The frequent finding in this study of congenital intracranial aneurysms and bicuspid aorta valves, both of which lead to fatal complications, militates somewhat against the otherwise hopeful expectations from surgery. On the other hand, surgery affords the only possible cure of this condition.

## Heart in Uræmia

Langendorf and Firani (*Am. Heart J.*, **33**: 282, 1947) write that twenty-seven fatal cases of uræmia are presented

and their electrocardiographic and anatomic changes are described.

The sole demonstrable characteristic anatomic lesion is pericarditis, which was present in 41 per cent of the series and which frequently extended into the adjacent myocardium.

The myocardial changes are those attributed to hypertensive heart disease with additional diffuse fatty degeneration, cloudy swelling of myocardial fibres, and interstitial œdema. While fatty degeneration was probably caused by concomitant anæmia, the cloudy swelling and interstitial œdema can be attributed to the uræmic intoxication but cannot be considered diagnostic of uræmia. There is no evidence to support the existence of a specific so-called urœmic myocarditis.

The factors responsible for the changes in the electrocardiogram of patients with uræmia are chronic left heart strain, myocardial changes due to coronary artery disease, diffuse pericarditis, and changes in the electrolyte balance which give rise to hypocalcæmia and hyperpotassæmia. Because of the opposite effect of some of these factors on the electrocardiogram, the changes tend to obscure or balance each other, as revealed by serial electrocardiograms.

Evidence of hyperpotassæmia was found in six cases. Tall narrow T waves, which are the early sign of potassium poisoning, were seen in five cases; additional intraventricular and auriculoventricular conduction disturbances, a later sign of potassium poisoning, were present in one case. The terminal stages of potassium poisoning which are characterized by auricular standstill and final ventricular standstill or ventricular fibrillation were not observed, since no tracings were obtained immediately before death.

T-wave changes indicative of hyperpotassæmia were observed in one case as long as nine weeks before death.

The effect of hyperpotassæmia on the electrocardiographic pattern of left heart strain is emphasized.

The combination of a prolonged electrical systole of the hypocalcæmic type with narrow tall T waves indicative of potassium poisoning is the most characteristic electrocardiographic feature of uræmia.

Potassium poisoning seems to be the immediate cause of death in at least one-fifth of the cases of uræmia in man; the electrocardiogram is of value for the diagnosis of hyperpotassæmia and thus may give a hint as to the immediate prognosis in patients with uræmia.

### Physiologic Condition of the Heart in the Natives of High Altitudes

Rotta (*Am. Heart J.*, **33** : 669, 1947) gives in the following lines the summary of his observation :

Measurements of cardiac size have been verified and a study has been made of some aspects of the circulatory physiology in subjects who are natives living at 4,540 metres above sea level. The determinations include the following : The study of 400 frontal x-ray films in which the transverse diameter and the frontal area of the cardiac silhouette were measured, using the method of Ungerleider and Gubner; eighty fluoroscopic examinations of the heart, especially in the anterior oblique position; analysis of 100 electrocardiograms obtained in the three classic leads, six unipolar precordial leads, and three unipolar limb leads, and finally, the study in sixteen subjects of the cardiac output per minute, the stroke volume, the arterial pressure, the venous pressure, and the arm-tongue and arm-lung circulation time.

The analysis of the data obtained gives the following general results :

An increase in the transverse diameter of the heart in 69·5 per cent of the cases with an average increase of 19·5 per cent. An increase of the frontal area of the cardiac silhouette n 67 per cent of the subjects with an average increase of more than 21·3 per cent was found.

In 65 per cent of eighty fluoroscopic examinations of individuals who showed an increase of their cardiac measurements, clear signs of right heart predominance were found.

The electrocardiograms showed the following interesting findings : Aqrs was deviated toward the right between 90 and 180 degrees, in 59 per cent of the subjects; Aqrs was strongly deviated toward the left, between 90 and 180 degrees, in 21 per cent. S was larger than R in all, or in almost all, precordial leads in subjects in whom a high degree of deviation of the axis to one side or to the other existed. The principal deflection was negative in Lead I in 30 per cent of the subjects, negative in Leads I and II in 32 per cent, and negative in the three classic leads in 24 per cent. The intraventricular conduction time was found increased in 28 per cent of the subjects, including seven with right bundle branch block. Tracings typical of cor pulmonale were often observed.

Phonocardiographic study demonstrated that the reduplications of the cardiac sounds which have been frequently found in the natives living in high altitudes were reduplications in the strict sense. The reduplications of the first sound accompanied bradycardia, and those of the second sound were associated with radiographic or electrocardiographic manifestations of right predominance.

Among the principal circulatory characteristics studied, the most important findings were the following : A slightly high cardiac index; low systolic pressure; normal diastolic arterial pressure, with a decreased pulse pressure; venous pressure higher than that at sea level; and slightly delayed arm-tongue and arm-lung circulation times.

All these data suggest that the heart of a native, or of an individual who has lived for a long time at a high altitude, hypertrophies by the effect of "anoxia anoxica". The predominance of the right side, which is found frequently, is due to overwork of this portion of the heart which is the result of functional and anatomic alterations of the lung. At high altitudes the heart is working close to its maximum capacity. A very long stay in high altitudes, therefore, is harmful from a cardiocirculatory point of view.

### Trimethadione (Tridione) in Petit Mal

The reports of two fatalities resulting from the use of tridione for epilepsy constitute a warning to the profession, since this drug is now available on prescription. The previously reported toxic effects of the drug were few and apparently unimportant. The drug appears highly effective in the prevention of petit mal atitacks in childhood, but not of grand mal attacks.

In one of the cases reported, a sixteen-year-old girl had received tridione and dilantin each in doses of 0·1 gm. three times a day for six months. The second case was that of a young woman of twenty-three who had been taking tridione over a period of ten months, usually 4

grains a day. She also had taken phenobarbital for the past nineteen years without ill effect. Both individuals developed severe anemia, granulocytopenia, and purpura, which failed to respond to treatment. At autopsy the bone marrow showed a marked reduction in hemopoietic tissue.

Apparently, tridione must be put in the same category as amidopyrine (to which it is similar in structural formula) in its effect on the bone marrow and on leukocyte production. While idiosyncrasy doubtless explains the effect of both drugs on the bone marrow, and is comparatively rare, yet the patient receiving tridione should have periodic red and white cell counts, and any toxic manifestations such as gastric irritation, nausea, skin eruptions or blurring of vision, should indicate the cessation of its use. It should not be used in the presence of any blood dyscrasia.—*Minnesota Med.*, **30**: 528, 1947.

### The Treatment of Motion Sickness

Noble, Sellars and Best (*The Canadian M. A. J.*, **56**: 417, 1947) publish a report of the results of an investigation carried out under the auspices of the National Research Council of Canada for the evaluation of drugs for the prevention or alleviation of motion sickness. Of the belladonna alkaloids hyoscine is the most effective, but a mixture of hyoscine and hyoscyamine may have less unpleasant or dangerous side-effects. It was found in healthy young men of average size (70 kgm.) that an initial dose of 0·3 mgm. hyoscine HBr plus 0·8 mgm. hyoscyamine HBr. was effective, protection lasting from six to ten hours. Subsequent doses should not exceed one-half the initial dose and should be separated by an interval of eight hours or more. The only adverse effect noted was dryness of the mouth. Children have a lower tolerance to belladonna than adults. Of the barbiturates, V-12 (ethyl-B-methyl allyl thiobarbituric acid: Abbott Laboratories), whilst possessing as good or better protective properties, has such a low depressant action that doses of 315 mgm. or more could be tolerated without undesirable side-effects. There is considerable individual variation to effective dosage, but it was found that the best results were obtained when therapy was instituted on the day before exposure to motion. Divided doses are preferable and few individuals show undesirable reactions if 155 mgm. is taken with breakfast and 155 mgm. with supper. Taking V-12 with meals is desirable as absorption is prolonged thereby. In resistant cases an extra 155 mgm. may be taken with the midday meal. Therapy should be continued during short trips, but the duration of protection after the drug is stopped is about fifteen to eighteen hours. The immediate symptom of over-dosage is sleepiness, which should be used in assessing individual tolerance, and is a contraindication in increase of dosage. It is stated that in no case should a total daily dosage of more than 460 mgm. be used, and in cases requiring this large dosage a reduction after one or two days is advisable. A mixture called the "Canadian Motion Sickness Remedy", and consisting of Hyoscine HBr 0·1 mgm., hyoscyamine HBr 0·3 mgm. and V-12 (ethyl-B-methyl-allyl thiobarbituric acid 130 mgm. is commended, the suggested dosage being 2 capsules taken two to four hours before exposure to motion, followed by one capsule every eight to twelve hours. In highly susceptible individuals the therapy may be started twentyfour hours before exposure to motion. Dosage should be reduced on the occurrence of undue hypnosis and dryness of the mouth, and in no case should more than three capsules be taken in twenty-four hours. For children and small adults the dosage should be reduced. Treatment with these capsules should never be given for more than five days each week or undue accumulation of the thiobarbiturate may occur.

### Synthetic Folic Acid

Spies and Others (*J. A. M. A.*, **134**: 20, 1947, in this communication reports the first patients with sprue, addisonian pernicious anemia and nutritional macrocytic anemia to whom synthetic pteroyldiglutamyl-glutamic acid, which is a conjugated form of folic acid, has been administered and found to be effective in producing a hematologic and clinical response. It must be kept in mind that there are many substances that may act similarly. This substance differs chemically from the L. casei factor (folic acid) in that it has 2 more molecules of glutamic acid and is not excreted so promptly in the urine of persons with macrocytic anemia as is the L. casei factor. Pteroyldiglutamylglutamic acid and the L. casei factor, if given in sufficient amounts, are capable of producing a hemopoietic remission. Although we gained the distinct impression that, milligram for milligram, the response to synthetic L. casei factor is greater than that to the conjugated form, this observation is particularly significant in view of the fact that so much of the folic acid in nature occurs in the conjugated form and that Suarex, Bethell and Spies, with their associates, have shown that many patients with macrocytic anemia are unable to convert the vitamin B (a conjugated form) to free folic acid. All investigators in the field have been concerned with a satisfactory explanation for the fact that a large amount of folic acid or related compounds is required to produce a satisfactory hemopoietic response, whereas relatively little of the active substance of a potent extract of liver is required.

### Globin or Protamine Insulin?

Globin insulin was originally introduced as a delayed-action insulin intermediate in time of action between soluble insulin and protamine zinc insulin. There was the further advantage that globin was cheaper and more readily obtainable than protamine. In spite of these claims it has not yet been widely adopted in Great Britain, though our American colleagues have been more enthusiastic. In a renewed attempt to clarify the issue, two American workers (Roberts and Yater, *Ann. Int. Med.*, **26**: 41, 1947) have compared the action of these two insulins in 84 diabetics, several of whom were studied on more than one admission, thus giving a total of 97 hospital admissions. During the investigation the patients were kept in hospital and received a constant diet. Frequent blood-sugar estimations were made. When all the relevant data were assessed blood-sugar curves, hypoglycæmia, and the patient's general state—it was found that, on the same doses, 65 were controlled better with globin, 25 with protamine zinc, and 7 equally well with the two insulins. Composite curves drawn from the average blood-sugar levels at different times of the day showed that the fasting blood-sugar was the same with the two insulins, but at every other time (*i.e.*, 9 and 11 A.M., 1, 4, 7, and 11 P.M.) the blood-sugar was higher in patients receiving protamine zinc insulin than in those receiving globin insulin. With globin insulin the blood-sugar returned to normal limits

before lunch, supper, and midnight, which it never did with protamine zinc insulin. Glycosuria was significantly less with globin than with protamine zinc insulin; and, though the incidence of hypoglycæmic reactions was low with both insulins, only one mild reaction was recorded with globin, compared with three mild and two moderate reactions with protamine zinc.

It is often said that globin insulin is unsatisfactory because, if given in the morning, it does not control the blood-sugar during the following night. Roberts and Yater (*loc. cit.*) do not bear this out, for the fasting blood-sugar was the same in patients receiving the same number units of globin and of protamine zinc insulin. In this country a combination of soluble insulin and protamine zinc insulin is often prescribed, on the principle that the rapidly acting soluble insulin will control the blood sugar until the protamine zinc insulin comes into action. This combination often works in practice, but many patients find it more difficult to give themselves a single injection consisting of different volumes of two insulins than two separate injections of soluble insulin, morning and evening. Another disadvantage of protamine zinc insulin is that when given in the morning it may induce hypoglycæmia during the following night, when it may not be discovered until the patient has been in coma for several hours. With globin insulin this risk is minimised since hypoglycæmia is most likely to occur during the afternoon. There will always be diabetics who cannot be satisfactorily controlled with single daily injections of either globin or protamine zinc insulin. For these Roberts and Yater (*loc. cit.*) suggest two injections daily of globin insulin —one (70%) in the morning and the other (30%) about 3 P.M.—*Lancet*, **1**: 418, 1947.

### Treatment of Herpes Zoster with Contramine

Bengis (*South Afr. M. J.*, **20**: 467, 1946) reports satisfactory results from the use of contramine in herpes zoster. Contramine is an organic sulfur compound with the formula diethyl-ammonium-diethyl-ditio-carbamate. According to the author it was first used by Hawkes who found it effective also in the treatment of chicken-pox. The drug was given intramuscularly in doses of 0·125 gr. per c.cm. As there was no guide as to the number of injections required, the pain, which occurred with the onset of the herpes was used as criterion, and contramine was given every day until the pain had subsided, with a maximum of six injections. Pain subsided rapidly and the eruption became dry. The average number of injections required to attain this result was three. In older people the pain seemed to last longer. Contramine did not prevent the full development of the lesions. No toxic effects were observed, with possible exception of nausea in the youngest patient of the series. In only one patient there was post-herpetic neuralgia. In this case the lesion was very extensive, involving five dorsal segments.

### Treatment of Anuria following Intravascular Haemolysis

Dobbs (*Lancet*, **1**: 360, 1947) writes that a case of post-transfusion anuria is described in which decapsulation was followed by immediate satisfactory diuresis and eventual recovery. Improvement in urea concentration by the kidney and in the uræmic condition of the patient was delayed several days. Probably such improvement cannot take place until diuresis sets in. It follows that, where decapsulation or other operative procedure is contemplated, it should be undertaken early.

The mortality in reported cases treated conservatively was over 65%, whereas 7 of 8 patients recovered in whom decapsulation was performed. Moreover diuresis invariably followed within 12-24 hours, suggesting that coincidence is not an adequate explanation of their recovery.

Unilateral decapsulation appears to be sufficient and is probably followed by diuresis and eventual recovery in both kidneys.

Rapid diuresis but slow recovery of the concentrating power of the kidney suggests that anuria and tubular damage have a separate aetiology. Tubular damage is sustained as the toxic products of haemolysis pass down and are concentrated in the tubules. Raised intrarenal tension possibly plays its part in the production of anuria, but a more satisfactory explanation is that it is reflex in origin, and that decapsulation is effective by removing sympathetic nerve impulses. Recent work has suggested how such a reflex anuria may operate.

The spinal anaesthesia used in the operation of decapsulation may be a factor in initiating diuresis.

Splanchnic block would be a more satisfactory method and has been used with success in reflex anuria and in tranfusion kidney. The procedure is simple and deserves further trial.

### Chronic Right Iliac Fossa Pain

Wass (*Guy's Hosp. Gaz.*, February 15, 1947) states that apart from the appendix there are certain causes of chronic pain in the right iliac fossa. These are: (1) Inguinal or femoral hernia, (2) chronic inflammatory lesions of the inguinal glands, (3) mesenteric adenitis, (4) regional ileitis, (5) caecal distension, (6) loading of the caecum associated with constipation, (7)i spasm of the caecum, (8) cancer of the caecum, (9) pyelitis, stone in the ureter and hydronephrosis, (10) chronic (tuberculous) psoas abscess, (11) certain gynæcological conditions, (12) functional conditions. As regards "chronic appendix", there are three conditions in which appendicectomy is the correct treatment, namely recurrent subacute appendicitis, recurrent appendicular colic and "chronic appendicitis" occurring as a sequel to either of these conditions. "Chronic appendicitis", however, is not to be regarded as a cause of persistent pain in the right iliac fossa in the absence of a history of definite attacks of pain in the past. In appendicitis cases too much reliance should not be placed on an x-ray examination. Failure of the appendix to be visualised in the barium examination does not mean that it is pathological. Sixty per cent of appendices lie behind the caecum and when the latter is filled with barium the retrocaecal appendix obviously is invisible. Irregular filling of the appendix, kinking, or apparent fixation during the screening are not definite evidence that the appendix is diseased.

### Supraspinatus Syndrome

Armstrong (*Lancet*, **1**: 94, 1947) says that lesions of the supraspinatus tendon and subacromial bursa are the commonest cause of pain in the shoulder. This paper is based on 89 cases collected in three years. The mechanism by which the syndrome is produced is simple. In the middle range of abduction of the humerus the supraspinatus tendon, with its covering bursa, impinges against

the overlying acromion. When a lesion of tendon or bursa exists, this pressure causes pain, and reflex muscle spasm accompanies any movement that tends to bring the lesion into contact with the acromion.

The cardinal signs of supraspinatus syndrome are (1) a painful arc (between 60 and 120 degrees) on abduction of the humerus, (2) reversal of the normal scapulohumeral rhythm and (3) tenderness on deep pressure over the supraspinatus tendon. Pain may lead to disuse, adhesions and limitation of movement. Two-thirds of the patients recovered spontaneously. The remaining third were cured by acromionectomy.

### Burn Shock: Its Treatment with Continuous Hypodermoclysis of Isotonic Solution of Sodium Chloride into the Burned Area

Berman and Associates (*Arch. Surg.*, **53**: 577-587, 1946. Ref. *Med. World*, **66**: 500, 1947) say that experimental studies on dogs revealed to Berman that when burn shock is treated with isotonic solution of sodium chloride injected by hypodermoclysis into the burned area, the following significant facts are observed: (1) There is a loss of water and electrolytes, chiefly salt, followed by plasma proteins into the burned area. (2) This loss continues until pressure in the tissue spaces equals the hydrostatic pressure within the capillaries. Then reabsorption begins but in the reverse manner. That is, colloids are returned first by the lymphatic vessels, which behave as a semipermeable membrane. Then crystalloids are absorbed by the capillaries. (3) The loss of plasma occurs earlier in the more severely (third degree) than in the less severely burned animals. (4) Treatment by hypodermoclysis of isotonic solution of sodium chloride into the burned area seems to decrease the amount of water and plasma lost, and it facilitates the absorption of both. (5) It is thus an autotransfusion of lost colloids and crystalloids and, in addition, is a method for supplying quickly the great demand for salt by injured tissues. (6) It makes possible the dilution and excretion of hypothetic toxins, helps control body temperature and prevents pulmonary oedema and anuria.

Since human skin is not as loosely attached to the subcutaneous tissue as is that of the dog, multiple injections would be necessary, but much less solution would be needed to produce an intercellular hydrostatic pressure above that of effective capillary pressure.

Recently this method of treatment was used in two patients who were burned so extensively that their condition seemed hopeless. These two cases are described in detail. One of them died and the other one survived.

Commenting on these cases the authors say that the treatment of burn shock with hypodermoclysis of isotonic solution of sodium chloride is simple and effective. It is also useful in neutralizing or diluting hypothetic toxins, as illustrated in the patient whose burn toxaemia was adequately controlled by this method. In the other (fatal) case, it was at least partially neutralized. While two cases are insufficient to prove any concept, these observations, coupled with the experimental work referred to, form a basis for further study. The patient who died had an alkalosis which may have been due to an excess of sodium.

The authors sound a warning concerning excessive administration of sodium and fluid. Even though the fluid is given subcutaneously or by mouth it is believed that in the late stages of burn toxaemia slight underhydration is safer than overhydration and acidosis is more easily controlled than alkalosis.

The authors conclude that the use of isotonic solution of sodium chloride by continuous hypodermoclysis into the burned area is to be strongly recommended in extensive burns for the treatment of burn shock and toxaemia.

Isotonic solution of sodium chloride by hypodermoclysis is useful during the granulation stage of burn wounds to increase resistance to infection and to stimulate healthy granulation tissue.

### Management of Empyema

The treatment of empyema has suffered from the failure to distinguish the various forms of pleural infection. This was clearly brought out in a discussion at the Royal Society of Medicine opened by Mr. R. C. Brock and Mr. T. Holmes Sellors on Feb. 5. It should be obvious that an acute and diffuse inflammation in the early stages requires different handling from a longstanding localised purulent collection, but since the introduction of chemotherapy there has been a tendency to concentrate on the sterilising effect and ignore the final healing processes.

The influenza pandemic of 1918 brought out very clear the dangers of ordinary drainage in the early stages of empyema, and Graham's work showed that the patient already suffering from an acute pulmonary inflammation could ill support the addition of an open pneumothorax. The lessons then learnt resulted in delayed drainage being employed after preliminary and repeated aspiration had reduced the volume of the original pleural infection. An intercostal tube and closed drainage had a considerable vogue along with various methods of tidal irrigation and drainage, but the basic principles of treatment were not always fulfilled and results were often poor. Failure to remove the products of inflammation completely or to establish adequate and continued drainage were and still are responsible for chronic empyemata and consequent grave disability. The healing process or obliteration of the cavity has been greatly helped by physical treatment which by stimulating inspiratory efforts encourages lung expansion. Breathing exercises can play a very valuable part in chest work, but the most assiduous attention and concentration are required if they are to achieve their aim—the restoration of complete respiratory function.

The sulphonamides and penicillin have had a dramatic influence on the primary cause of empyema-pneumonia—but how far they have affected the incidence of empyema is still doubtful. In most cases penicillin will control the virulence of the pleural infection, and it is here that the drug is most valuable. The pleural fluid can often be sterilised by the injection of penicillin in suitable concentration after aspiration. Repeated aspiration and injection, persisted with along the lines suggested by Fatti and his coworkers (*Lancet*, **1**: 257 & 295, 1946), can produce good results, but in the later and more localised forms of empyema the value of penicillin therapy is more doubtful, unless it is supplemented by orthodox drainage methods. Neither penicillin nor any other known drug will close an empyema cavity, though it may sterilise the contents. Established abscesses contain masses of debris and fibrin which cannot be removed through an aspirating needle or even an intercostal tube. Here it is more satisfactory in the long run to follow the standard principles of surgical drainage. In draining a localised pleural abscess the actual

ribresection should afford room not only for a wide bore tube but for removing all fibrin masses and inspecting the interior—in short, for an efficient pleural toilet. The drainage-tube must be carefully sited to permit of gravity drainage and kept in position until the empyema cavity has been completely obliterated. During closure pleurograms enable the surgeon to visualise the shape and size of the cavity and make adjustments as required.

During the whole treatment physical therapy must be in constant use. Patients need not be confined to bed for more than a few days after rib-resection, but at no time must observation or attention to detail be relaxed. Treatment must be active the whole time under the direct care of the surgeon.—*Lancet*, **1** : 418, 1947.

### Periodontal Infection

Blanguie (*J. Am. Dental A.*, Feb. 1, 1947, Ref. *Med. World*, **66** : 599, 1947) says that the general practitioner has the privilege of observing periodontal infection in its earliest stage, whether the starting point be in the gingivae or in the crests of the alveolar process. Inflammation and bleeding in the soft tissues and a slight decalcification or breakdown in the base are the earliest visible indications of pathological changes having started in the periodontium. Prophylaxis should include more than the ordinary cleaning of the crowns of the teeth. The patient should be thoroughly instructed as to the proper care of the mouth and the correct use of a properly designed tooth brush with a suitable dentifrice. All irritating matter contained within the subgingival space should be very carefully and thoroughly removed. Scaling will be necessary in most cases and this should be followed by polishing so as to render the subgingival space as smooth as possible. This prophylactic measure should be repeated at least every six months. A case of ordinary gingivitis, which is uncomplicated by systemic factors, will usually respond satisfactorily to this treatment.

### Manual Removal of the Placenta

The cautious attitude of British obstetricians to manual removal of the placenta has been based on a lively fear of "obstetrical shock" and intra-uterine sepsis. There was good reason for this attitude two decades ago, when there was no chemotherapy and blood or plasma for transfusion was not immediately obtainable. Even with these safeguards, however, the risks of manual removal have not disappeared. According to Sewall and Coulton (*Am. J. Obstet. & Gynec.*, **52** : 564, 1946), this is because manual removal has only been employed when the patient is already shocked and anaemic; and they attribute the bad results of the operation to the bad timing of its performance. They support their view by recording 45 consecutive manual removals under their own or their residents' care in which the mortality was zero and only one patient, already suffering from bronchitis and pyelonephritis, gave rise to anxiety. No special technique was used, and the indications for the operation were blood-loss in 15 cases, expected blood-loss in 22 cases, and retention of the placenta in 8 cases. Chemotherapy was employed in 22 cases. Shock was absent in the whole series, though what is described as subclinical shock was noted in 3 cases.

The average time from the beginning of the third stage until manual removal was performed was 8 minutes in the cases undergoing manual removal for blood-loss, and 14 minutes where the removal was done prophylactically for fear of blood-loss. In other words, these workers waste no time in manually removing the placenta. They urge that Crede's expression should not be persisted with too long. Protracted and vigorous attempts at Crede's expression are extremely liable to cause shock and Sewall and Coulton think they also make subsequent manual removal hazardous. They, therefore, use a trial expression once. If this is not successful, they wait for 20 minutes and repeat it; and if the second attempt fails the placenta is removed manually. When there is bleeding, manual removal is used much more quickly. In 5 cases the uterus was packed; and it is claimed that packing does not increase morbidity—with prophylactic sulphonamides, of course.

Forty-five swallows do not make a summer, and the enthusiasm of these Massachusetts workers is not likely to change our more conservative attitude; but their experience does strongly support their view that if manual removal is going to be employed it should be resorted to more quickly than it has been in the past. In a fit woman not yet suffering from the effects of blood-loss it is a relatively simple operation. In a shocked and anemic woman it is hazardous and possibly lethal, and its morbidity may well be attributed to the poor state of the patient rather than to the inherent vice of the operation.—*Lancet*, **1** : 417, 1947.

### Placenta Praevia

Jeffcoate (*Practitioner*, **159** : 15, 1947) writes that the different methods of treating placenta praevia have been subjected to critical review in recent years and as a result many have come into disfavour. Indeed, so far as the safety of both mother and child is concerned, "it would appear that there remain really only two methods of treatment for placenta praevia. . . . The alternatives are rupture of the membranes for the slighter cases of lateral placenta praevia, and Caesarean section for all others" (Munro Kerr, 1946). This is true with a few exceptions; for instance, sometimes in first and second degree placenta praevia, the bleeding is slight and there is no need to interfere with the natural course of labour; or again, the hæmorrhage may not occur until the cervix is fully dilated, when all that is necessary is immediate delivery with forceps.

(a) *Artificial rupture of the forewaters*—This gives satisfactory results in first degree cases and also in second degree cases provided labour is in progress, the uterus contracting well and the cervix already partly dilated. It is least efficient when the placenta is on the posterior aspect of the lower segment, for the fœtal head cannot then sink down and compress the separated part of the placenta. In such cases Caesarean section is preferable.

(b) *Caesarean section*—This is the treatment of choice in all cases of third and fourth degree placenta praevia, and is usually the best for second degree cases when the patient is not in labour or when the cervix is less than two fingers dilated. Leaving aside the possibility of coincidental factors such as pelvic contraction, and considerations of age and parity, it is indicated as a rule in all cases in which, at the time of the hæmorrhage demanding active treatment, the patient is not in labour with the cervix appreciably dilated and uncovered by the placenta.

With few exceptions the lower segment operation is desirable in view of the danger of infection and because, as

always it carries a lower risk than the classical operation. Moreover, it does not preclude natural delivery in future pregnancies. It may mean making an incision directly over the placenta and through an area of uterine wall where the veins are enormously dilated, but this is more alarming to the surgeon than dangerous to the patient. The initial incision with a scalpel should be small and is then stretched with the fingers as described by Marshall (1939). The real bogey is post-partum hæmorrhage from the atonic placental site, and this is just as likely, if not more likely, in the upper segment operation. The risk of hæmorrhage both from the placental site is largely dependent upon the type of anaesthesia employed. General anaesthesia with gas-oxygen-ether or cyclopropane must be light if it is to be safe. Local analgesia, supplemented, if need be, with a small dose of sodium pentothal intravenously during the delivery of the child and closure of the incisions, is the ideal, although spinal block is also satisfactory provided the patient is not exsanguinated and the operator is fully aware of its special dangers for the pregnant women and how to avoid them.

(c) *Other methods of treatment*—Other methods of treatment require only brief mention. Packing of the vagina is both inefficient and dangerous. Bipolar version involves a risk of causing further and dangerous hæmorrhage, although once completed the plugging with the half breech controls the bleeding well, at any rate in the lesser degrees of placenta prævia. The fœtal mortality rate, however, is 80 or 90 per cent. It is rarely indicated except when the foetus is already dead or is malformed, and the cervix is uncovered by placenta. Scalp traction by Wiliett's forceps carries a lower foetal risk, but its usefulness is limited to the less serious cases when artificial rupture of the membranes and the application of the binder have failed to control the bleeding completely.

(d) *Management of the third stage of labour*—The risk of third stage and post-partum hæmorrhage has already been emphasized, and should be kept in mind during either vaginal or abdominal delivery. The slightest difficulty in separation and delivery of the placenta or the onset of any bleeding should be met by immediate manual removal of the placenta together with the intravenous injection of 0·5 mgm. ergometrine.

### Leucoplakia Vulvae

Hams and Bloom (*Am. J. Obstet. & Gynec.*, **53** : 214, 1947) write that based on clinical study, herewith reported, the following conclusions have been reached :

Leucoplakia vulvae is of metabolic origin, due to a failure in utilization and/or absorption of vitamin A.

Uncomplicated cases of minimal leucoplakia can be relieved with adequate doses of vitamin A and dilute hydrochloric acid.

In four years of observation, not one case showed a tendency toward vulvar carcinoma. For this reason, the fact that leucoplakia is a neoplastic disease cannot be maintained.

Comparative microphotographs, pre and post-therapy, show the improvement in and tendency toward the normal histologic architecture, in treated cases.

It is hoped that this report will stimulate further observation and therapy of this condition throughout the country, with the therapy outlined.

The daily oral dose varied from 250,000 units to 500,000 units of vitamin A, supplemented by injections of 50,000 units twice weekly. In addition each patient received 15 minims of hydrochloric acid in water three times daily with each meal.

### Curare and Intensive Physical Therapy in the Treatment of Acute Anterior Poliomyelitis

Ransohoff (*Bull. New York Acad. Med.*, **23** : 51, 1947) write that a method of treatment of acute anterior poliomyelitis has been presented which utilizes the relaxing effect of curare to enable the immediate institution of intensive physical therapy, thus re-establishing and maintaining normal muscle physiology.

Electromyographic studies were made on each of the twenty-nine patients with acute anterior poliomyelitis treated by the described method in 1945.

The dosage of curare recommended is 0·9 unit per kilogram of body weight every eight hours for the first twenty-four hours. It is then increased to 1·5 units per kilogram of body weight if there has been no adverse reaction.

The physical and occupational therapy procedures which are used are based on the objective of re-establishing and maintaining normal muscle lengths. Patients are made ambulatory as soon as possible, thus preventing loss of the kinesthetic sense of the upright position.

The psychological approach of the physical and occupational therapists to the patients is considered to be of great importance.

*Conclusion*—It is believed that the described method of treatment of patients with acute anterior poliomyelitis will accomplish the following. (a) Shorten the period of hospitalization. (b) Decrease the number of personnel necessary to care for the patients. (c) Give better functional results.

No claim is made that this is a cure for acute anterior poliomyelitis but that it is a better method of treatment.

### Nasal Sinusitis in Children

Gerrie (*The Medical Press*, March 19, 1947) points out that infected sinuses in children play an insidious and dangerous role. Not only is sinusitis common in children, but it is very disabling. It is not likely, however, that infected sinuses are important as foci of sepsis. The commonest symptom is a nasal discharge which is present not only when the child has a cold but persists between the attacks. The nasal passage is obstructed on one or both sides due to swelling of the mucous membrane. The patient is never free from colds. The cough is characteristically dry and hacking. It comes on when the child goes to bed. There may be sore throat as the result of dryness due to mouth breathing or tonsillar sepsis. The child may occasionally suffer from headaches and is generally anaemic and debilitated. Removal of tonsils and adenoids has no effect on a sinusitis, nor have nasal drops and sprays. Antral puncture and lavage are always indicated in such cases. The latter should be carried out at weekly intervals until the antrum has been completely cleared of pus. In the presuppurative stage vitamin A may be of value. Operation is seldom necessary in sinusitis when it occurs in children and should be carried out only after repeated lavage has failed to clear the sinus of pus. Certainly operation should not be attempted in the child until all other methods of treatment have failed as the results are far from being good.

# NOTES AND NEWS

## U. P. PROVINCIAL MEDICAL CONFERENCE

The next U.P. Provincial Medical Conference will be held at Basti, U.P. in the beginning of November, 1947. All medical men and women of the Province are hereby requested to kindly muster strong to make the conference a success. All those intending to take part in the activities of the scientific section and in the exhibition, that will also be organised along with the conference, should inform Dr. K. L. Srivastava, M.B.B.S., Hony. Secretary, I.M.A., Basti Branch. Arrangements will be made by the Hony. Secretary for the boarding and lodging of the members attending the conference if he is informed from beforehand. This year the Conference will have special importance as it will be the first after attaining independence and under the Governorship of Dr. B. C. Roy who may also be present in the Conference.

## I.M.A. DISTRESS RELIEF FUND

The following contribution to the I.M.A. Distress Relief Fund is gratefully acknowledged by Dr. P. K. Guha, Acting Hony. General Secretary, I.M.A. :

Benares Branch ... ... Rs. 175/-.

## SURAT MEDICAL MEN'S MEMORANDUM ON INDIGENOUS SYSTEM OF MEDICINE

*The following is the representation made to the Minister of Public Health, Bombay, by some of the leading medical men of Surat on Indigenous System of Medicine* :

The Governments of India and Bombay, are preparing a scheme to encourage the Indian systems of medicine by giving grants to the so-called Ayurvedic schools and colleges from tax-payers' money. It is, therefore, necessary that every right thinking man who is qualified to express an opinion should frankly do so. As Indians we are all proud that this system of medicine attained great eminence even without the accessory aids like microscope, x-ray, chemistry, electricity, etc., thousands of years ago. Their chief achievement was the establishment of what is known as 'Tridosh' theory. The authors of this sysytem of medicine must have been gifted men of great learning and deep insight.

This system of medicine reached its zenith and spread far and wide. It even got a footing in the European countries for some time. Later on however, the searching eyes of the Western scientists put all the theories propounded in this system of medicine, to the test of reason with the result that the "Tridosh theory" was given up. Careful dissections of human bodies, experiments in physiology and development of sciences of bacteriology and pathology, contributed tremendously to the rapid advance of scientific medicine, and the old Ayurvedic medicine gradually developed into the modern Allopathic system of medicine. The *vaids* in this country, however, never questioned the authority of the Ayurvedic system, and blindly followed it from father to son. This lethargy and the habit of taking things granted were responsible for the downfall of this system. Thus while Western scientists through their intelligence and industry changed the very face and structure of Ayurved, the *vaids* kept it as they inherited it from their forefathers. The inevitable result was that Ayurved remained undeveloped, ill-nourished and uncared for and became a rickety, disfigured relic of the old system of Indian medicine, which could not stand the test of reason and logic.

The same Ayurved returned to India in a pruned, revised and enlarged form. Unfortunately it returned to India with the British rule and is, therefore, looked upon with great prejudice as foreign and different from the old system of Ayurvedic medicine. Some political leader at the helm of the administration, also helped in strengthening this belief by calling the modern allopathic medicine as foreign medicine, and thus started the state recognition of Ayurved.

We believe that these well-meaning but misguided leaders are doing positive harm to the medical profession and also to the country. It is wrong to label the modern allopathic system of medicine as foreign. It is no more western than eastern. It is only by a sheer historical accident that its message has reached us through the British. It is a science, and science knows no distinction of caste, creed or colour. Its scope is being enlarged constantly, consequent to the work of its votaries who are spread all over the world. We do not talk of eastern chemistry or western chemistry and eastern physics or western physics. We are at a loss to understand why with regard to medicine alone, people should still persist in talking of eastern medicine and western medicine. The truth of science cannot be a respector of nations.

A thorough knowledge of basic sciences of physics, chemistry, biology, anatomy, physiology, etc., is absolutely essential before a student starts learning medicine or surgery. A system of medicine, in which there is hardly any attention paid to subjects like anatomy and physiology, a system in which the sciences of bacteriology and pathology are not taught at all, a system which does not stress the importance of antiseptics much less of asepsis, in our opinion, does not deserve state recognition, and should not be taught at all. Ayurved has only one place in the modern medical education, and that is as a subject of study in the History of Medical Science.

The so-called Ayurvedic or Unani schools or colleges, which claim to impart training to its students in their respective systems of medicine are in a deplorable state. The students trained in these institutions, be they *vaids* or *hakims* are always anxious to style themselves as doctors. While loudly singing the past glories of Ayurvedic or Unani systems of medicine, they always move about with a stethoscope, more as a piece of decoration, to pass off as doctors. They make full use of modern allopathic medicines, give injections and even carry out minor surgical operations, very often with disastrous consequences. We are all convinced that if statistics of mortality and morbidity of patients who fall victims to these practitioners were compiled, the figures would be simply appalling.

Schools training students for the L.C.P. & S. have now been expanded for University degree training with the sole aim of maintaining a uniform standard of medical education. With the opening of Ayurvedic schools and colleges

men of lower calibre and training inferior to even that imparted to Licentiates at present will get state recognition. Thus the very object with which the L.C.P. & S. diploma has been abolished will be frustrated.

It has been argued that Ayurvedic schools and colleges are necessary because of the great scarcity of medical men all over the country. But the dearth of medical men is felt in villages and not in towns, and cities. If ever a case is to be made out in favour of Ayurvedic institutions on this ground, then persons trained in such institutions should be only permitted to practise in such place, where medical assistance of trained graduates is not available within a radius of five miles.

It is indeed fortunate, that at present we have as Minister of Health a highly qualified medical man, who will readily appreciate our arguments and will not allow false patriotism to suppress reason. In the interest of our country in general and the medical profession in particular, we earnestly request him to withdraw state recognition of the Ayurvedic and Unani systems of medicine.

## U.S.A. NATIONAL HEALTH SERVICE

President Truman on May 16 asked Congress to give "immediate attention to enactment of a national health and disability insurance programme to assure that the "opportunity for good health be made available to all, regardless of residence, race, or economic status".

The President's message said such a programme should include :

"1. Adequate public health services, including an expanded maternal and child health programme.

"2. Additional medical research and medical education.

"3. More hospitals and more doctors—in all areas of the country where they are needed.

"4. Insurance against the costs of medical care.

"5. Protection against loss of earnings during illness."

The President said "at no time can we afford to lose the productive energies and capacities of millions of our citizens. Nor can we permit our children to grow up without a fair chance of survival and a fair chance for a healthy life. We must not permit our rural families to suffer for lack of physicians, dentists, nurses and hospitals. We must not reserve a chance for good health and a long productive life to the well-to-do alone. A great and free nation should bring good health care within reach of all its people.—*Medical World*, **66** : 439, 1947.

## OBSTETRICS AND GYNECOLOGY INDEX

Henry J. Klaunberg, Ph.D., President, Washington Institute of Medicine, 1720 M Street, N. W. Washington 6. D. C. writes :

We feel certain that many of your readers will be interested in knowing of our making available the Obstetrics and Gynecology Index, (Subscription : 1940-49, $50.00. Annual Subscription thereafter $7·50). This work was compiled in the Surgeon General's Library, Washington, D.C. by a staff of professional medical indexers. During the past several years many of the foremost obstetricians and gynecologists have requested that we provide such an index. Specialists in other fields have made similar suggestions. We plan to publish similar indexes in the other special branches of medicine and surgery. Any courtesy you may extend in your editorial columns to call attention to this work will be appreciated.

## INTERNATIONAL SHORT WAVE CONGRESS 1948

Dr. J. Samuels, Weteringschans 73, Amsterdam writes :

The sixth international shortwave congress will be held in Amsterdam from 19th-24th July 1948.

Those, who wish to take part in the congress, are requested to communicate with me for further informations.

Colleagues, who wish to give a lecture or an address on the congress, in connection with this science, (therapy, biology or physics) are requested to apply early and to send in the manuscript before 15th April 1948 at the latest, to colleague W. F. K. Gouwe, Lutten-Dedemsvaart Holland, so that the contents can be inserted in time in the report of the Congress.

## SUCCESS OF ANTI-MALARIA OFFENSIVE

A major public health problem in India, malaria accounts for over a million death every year. While no province is free from its ravages, in some the incidence of the disease is extremely high. In the article below, Joseph Kalmer describes how in two other malaria-infested countries the death rate has been reduced with the help of insecticides.

D.D.T. and other chemical products discovered during World War II are still "on active service"—two years since the end of the war. They are helping to fight mankind's unceasing battle against sickness and disease.

One of the diseases against which these wartime insecticides have achieved notable success is malaria, a scourge in tropical countries. The need for new measures to tackle such diseases as malaria arose from the fact that the endemic infection of certain areas, especially in the tropics, had in the past not only made living conditions difficult there, but rendered a number of economic projects inoperative until decontamination of the areas could be achieved. Reports have recently been received in London on the spectacular successes achieved in the fight against malaria in British Guiana and Cyprus.

*Mosquito Control Service*—British Guiana, on the North-East coast of South America, is a Crown Colony of about 155,000 square miles with a population of just over 375,000. This low population figure in an area with excellent mining and sugar growing prospects, is explained by the fact that some 266,000 of the people live in districts where malaria is endemic. Even Georgetown, the capital, with its 60,000 inhabitants, comes within the infected area.

D.D.T. was first used two years ago experimentally in the campaign against the malaria-carrying mosquito. The Mosquito Control Service was enlarged and thorough tests with every form of D.D.T. were carried out between February 1945 and the end of 1946. The Malaria Investigation Service was then amalgamated with the Yellow Fever Control and entrusted with "the elimination of all house-frequenting insects so prevalent and intractable under tropical conditions and in wooden structures".

The work can best be illustrated by an example. In Lodge Village, notoriously malarious, 60 per cent of children suffered between 1938 and 1945 from chronic malaria. The death rate exceeded the birth rate and infant mortality varied between 235 and 355 per 1,000 live births. Lodge Village was first sprayed with D.D.T. in July 1945, and this was repeated twice.

*Infant Mortality Reduced*—The effect was to double the 1946 live births figure compared with any of the previous seven years. Infant mortality dropped to 96 per 1,000 and, according to the latest malariological survey, only 18 per cent of children show symptoms of chronic malaria. The birth rate is now 234 for a death rate index of 100, an admirable result from a population point of view.

The Colony's Health Service, the Rockefeller Foundation, as well as the sugar and some of the mining industries in the Colony are closely co-operating in this campaign. Some 10,390 houses were sprayed with D.D.T., and this means that the dwellings of 60,000 people are under malaria control. A further 150,000 people, apart from 68,000 from the sugar estates, were also to be brought under control, which means that by the end of the year 80 per cent of the inhabitants of the malarial areas will be protected.

Georgetown is naturally included in these activities. A belt of houses in the danger zones were treated with D.D.T. every eight months, and it is hoped to lengthen this interval as mosquitoes lessen.

*The Cyprus "Campaign"*—A similar experiment was carried out in Cyprus, where the Kapas Peninsula, 45 miles long and 10 miles wide, was selected for the purpose. The Peninsula was cut off, as it were, along a 20 mile "frontier" from the rest of the island. The experiment was carried out to the East of this line, but westwards, too, an area five to 12 miles wide was also treated, making a total of 1,200 square miles in all. A four to five per cent. D.D.T. solution in gas oil was sprayed on all the mosquito breeding grounds; insecticides were also sprayed on houses, cattle sheds, sheep folds and chicken runs. By the end of October, 1946, the 1,200 square miles were declared to be mosquito-free.

The Government is now proposing to extend the campaign westwards and to "clean up" the towns of Morphou, Nicosia, Larnaca, Famagusta and Kyrenia. If the results prove as successful as with Karpas, the Cyprus Administration believes that within four years "the last anopheles mosquito should be driven into the Western Sea off Paphos"

D.D.T. is comparatively cheap and the labour required for an anti-malaria campaign is not excessive. In Cyprus some 80 workers were made available for the scientific staff. —*U.K. Publicity Service.*

## EXCHANGE OF PRACTICE

A register and an information bureau have been opened at the Central office of the I.M.A., 23, Old Hindusthan Buildings, Calcutta, to maintain a record of such members of the Association as intend to exchange practice.

Members will please communicate with all necessary particulars to the Acting Hony. General Secretary of the I.M.A. at the above address.

# CORRESPONDENCE

*The Editor is not responsible for any views expressed by contributors*

## ACADEMIC AND ETHICAL LIAISON BETWEEN INDIA AND ABROAD

Sir,—I am here for the past month. While in Cairo and Paris, and again here, I have had informal talks with medical people generally, including Sir John Megaw of the India Office, Sir Francis Fraser of the Post-Graduate Medical Federation of London, and the Secretary of the British Medical Association.

With the rapid changes in our political structure now visible so clearly on the horizon I have felt the need for a common and wide platform for the profession on which we could, to mutual advantage, obtain an academic and ethical liaison between India and the rest of the world.

It cannot be denied that our general standards do need being raised a good deal, and this cannot be attained quicker and with lasting effect without creating an organisation for wider freer and greater contact with progressive outer world. This could, certainly not be attained, frankly speaking, by a mere mass collection of L.R.C.P's and F.R.C.S's and the like. It is high time we changed our outlook from degrees and diplomas to practical post-graduate studentship and personal contact.

Further to clarify my point, I feel it is time that we arranged mutual visits and interchange of literature of and between top men of the world both for talks, in practical work and social and ethical contact; and send out our promising young men to work with these people practically rather than expect them merely to take a degree or diploma from U.K.

I gather from these talks that both here and in Paris and even in Egypt this will be welcomed without obligation.

Could our different associations, not form a "National" or "Indian Academy or Society" of medicine for the purpose? We may arrange, say, perhaps a dozen top ranking people from all over to visit us at say 3-4 centres in India for a week at each place—and one each time, and give us their best in academic, ethical and social aspects of the profession. We could, similarly send out our best and let the world know what we possess and/or do. And we might, then, also be able to fix up sending out a dozen and more of our selected young men to work with these people for specified periods, thereby raising practical standards—academic and ethical—both in the existing mass of the profession and in its future generation. Perhaps this may need Government, action or a University pool. Perhaps this may be possible of the proposed society (*e.g.*, pool of the various Associations) working with the various medical associations in other countries.

This is as far as the professional and academic side is concerned. There is also the acute and urgent question of our pharmaceutical side being developed similarly. We have very few real pharmaceutical manufacturers—most being merely makers of some concoction or other under patent names—to the detriment of the poor public and the profession alike. Some form of a common or group action in this respect also is badly needed.

What the details would be, and how all this could be given a practical shape, we will have to explore further.

I have just ventured, hereby, to circularise these scrappy notes of my observation and would be glad to have your

comments so that a further practical and concrete step may be taken later. I am etc.

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## HOW THE AYURVEDIC SYSTEM OF MEDICINE IS SCIENTIFIC

Sir,—To call a system scientific the theories adopted and every thing said therein must be capable of being tested practically, let alone the history of the source of information. But it is unfair to call unscientific, if you are not able to know or explain. It is again fairness to accept all that is scientific and leave the rest without criticism, which criticism may in the end exhibit only ignorance. Any scientific system of medicine to be complete must have the preventive side of disease, *viz.*, general rules of hygiene and the curative side of it *viz.*, root cause of diseases, names of diseases and diagnosis, treatment with meteria medica as a part and accessory treatment, which includes sick diet. The Ayurvedic system can boast of general rules of Hygiene, which till today holds the ground and coming to the curative side, the root cause is sufficiently detailed in terms of diet and conduct (*Ahara* and *Vihara*), which in their turn disturb the equilibrium of the Tridoshas which is the special and distinguishing feature of the Ayurveda Physiology and which is a merit, though taken or understood to be unscientific being incapable of perception to the senses or modern sciences and specially dealt with below. Regarding diagnosis it is more concise and comprehensive than other systems because the main classification of the disease is by the main symptoms (the root cause being considered in the compilation of the medicine which is to answer mostly for all types and causes) and coming to the treatment Ayurveda has a perfect Meteria Medica with general and special rules in the direction of preparing recipes to suit the disease (denoted by symptoms), from whichever cause the disease developed. Regarding accessory treatment the sick diet and the removal of the root cause, a student of comparative medicine can not but feel the completeness of Ayurveda let alone the superiority of it that has to be traced from the origin of any Meteria Medica in the world.

The allopathy cannot claim monopoly of modern science, present day achievements and progress and present injunctions and specific treatment while the other systems also can adopt the same and as stated above a resultant of all sciences is nearer perfection than any one system itself and probably Ayurveda is more complete in that direction. Coming to the scientific aspect of it, it can't but be said that the Ayurvedic system minus the Tridosha siddhanta (which is not understood by men, and which is thought to be unexplainable and hence unscientific) is less scientific than other systems particularly allopathy which has many gaps yet unfilled and probably can never be filled up excepting to vaguely explain by calling them something natural and what is more important is that the unexplained gaps of the socalled scientific allopathy are explained or are filled up thousands of years ago by the socalled unscientific tridoshas. This is shown below. It is a pity that having eyes we don't see and having ears we don't hear. If we ask it shall be given and if we knock it shall be opened.

To name just a few of the many gaps in allopathy not yet explained (*a*) what is it that makes the embryonic cells to divide themselves and multiply. (*b*) What is it that makes the heart contract and dilate so systematically and keep rhythm. (*c*) When it is accepted that the contraction of the heart and next dilation are not sufficient to supply the necessary force for the circulation of blood, (to go out from heart and again to get into from the other side) what is it in the body that aids circulation against the gravitation rules and against hydraulic laws. (*d*) What is it that supplies blood to peripheral arteries, which are some times blind channels, (against all hydraulic laws). (*e*) What is it that supplies blood to legs and hands situated farther off, when there is a short circulatory circuit through liver and abdomen. (*f*) What is it that explains the differential pulse vibration individually over each finger of the three finger laid on the wrist and elsewhere, when liquid blood is pumped from the heart and conveyed through rubber tube like arteries.

Any law of physics, chemistry, hydraulic engineering or the like won't fit into the above to give a scientific explanation and instead of tiding over by the calling them something peculiar in nature, where is the harm is attributing the above movement quality to the *vata* of the Ayurvedic Physiology and which is a *dravya* (slightly different from matter) and which is responsible for the above and many more like that. The existence and qualities of *vata* are given in the Ayurvedic Physiology thousands of years ago and you can get on with complete medicine of Ayurveda (even without the doshas) as much as you are getting on with the other systems but the tridoshas are the distinguishing factor which makes the system more superior and also original, (proof of the existence and qualities of the tridoshas are reserved for the present).

Having said about gaps concerning the movements in the body let us come to the opposite of that.

(*a*) What is it that automatically lays a check, as a brake or regulates as a governor on a machine, every excess movement in the system, be it circulation or other, (*b*) Why is that by simple gravitation blood from the abdomen won't descend to the feet when standing. (*c*) When a small artery is cut, why is it that it automatically heals itself instead of all blood of the body finding a way out. (*d*) Except under disease, what is it that keeps the body at about 98·4 degrees throughout when outside temperature is even 110°F. Many more like this are attributed to the *Kaphadravya* of Ayurvedic Physiology. Kapha has other definite qualities which are reserved for another occasion.

There is the 3rd the *Pitta dravya* of Ayurvedic Physiology which explains or fills up unaccountable gaps of allopathic physiology pertaining to all heat in the system besides other things left out for want of space.

(*a*) Every one of the parts of the human system is a bad conductor of heat and how is it that from the embryo state up to old age, the body is kept at a particular temperature inspite of the surrounding teemperature being some times 115°F. (*b*) How is it that such heat comes into existence with embryo and continues for some time after death also. (*c*) How is it that the warm blood supposed to be pumped from the heart is not warmer in the heart region but maintains the same heat throughout, that is even in capillaries, where the speed is half to one inch per minute. And this can't be possible unless there is something in the body whose function it is to keep up heat. (*d*) How is it that the heat in the body sometimes increases or decreases, not depending upon food which is supposed to supply the necessary coal but even without it in case of sick persons and also when people go on fast and keep without food for a long time (the above are points from a

book under preparion and many more are omited for want of space).

Thus it is respectably suggested that people of one system may have tolerance for other systems and an attempt be made to make a comparative study and assimilate all that is good. I am etc.

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## CLINICAL DIAGNOSIS OF EOSINOPHILIA OF THE LUNGS

Sir,—Ever since F. Mollard & Barton published their paper on Pseudo Tuberculosis of the lungs in 1940, papers on this subject under Tropical eosinophilia of the lungs, etc., have from time to time appeared in the medical press showing that the condition is by no means rare. The diagnosis can be easily made if all cases of chronic bronchitis with temperature, breathlessness, weakness, etc., get their blood examined as a routine for total and differential count as suggested by Joseph (*Indian M. Gaz.*, **81** : 515, 1946) and much unnecessary anxiety, expense and time saved because these cases are originally generally suspected to be cases of tuberculosis whose treatment is very prolonged and expensive. The treatment of this condition, once these cases are spotted out is quick and sure. Real as this examination of the blood would be in such cases it is difficult to be attained in small out-of-the way places, even many district towns where even ordinary elementary laboratory facilities are unobtainable. An average medical practitioner of a small town has to depend upon his clinical acumen generally. Hence any clinical sign which can at least lead a practitioner to suspect a clinical entity is perhaps worth pointing out and reporting so that others with more facilities and experience may evaluate them properly.

I have noticed (others may have pointed it out before but it is not to my knowledge as very little literature is obtainable to me here) that cases of eosinophilia of the lungs can be separated out from those of true tuberculosis of the lungs by (1) noticing the effect of exertion on the temperature of the patient. It is well known that exertion whether due to moving about or coughing sends up the patient's temperature in a genuine case of tuberculosis of the lungs and the controlling of this exertion forms the basis of sanatorium treatment along with other things, but it is not so in cases of eosinophilia. The severity of cough from which a case of eosinophilia suffers would send up the temperature in a tuberculosis case if he was to have the same severity of cough two or three degrees above the usual level of his temperature but the rise in eosinophilia is hardly a degree or so though the cough may be very severe and troublsome. I noticed this fact some years back in a patient of mine who was pronounced to be a bilateral active cases on x-ray examination and advised to be sent to a sanatorium by experienced physicians of a neighbouring district. Whole day exertion for getting x'ray in a place 50 miles away from his place along with severe cough did not affect the temperature as one would expect in an active bilateral case of tuberculosis. On the strength of the fact alone I suggested to the patient that his case was most probably not a case of tuberculosis but one of eosinophilia of the lungs which could be readily diagnosed by a simple examination of the blood. As this case had already secured a seat in the sanatorium he preferred to get any further examination done at the sanatorium. There he was confirmed to be a case of eosinophilia of the lung and showed a rapid improvement after receiving some acetylarson injections. I have since always attached great importance to the effect of cough and exertion on the usual temperature of tuberculosis suspected patient; if it is negligible, I have in some cases, without bothering about the blood examination, started acetylarson with gratifying result.

(2) The second point is about the extent of the physical signs in the lungs. There is hardly any correlation between the temperature and the other constitutional symptoms of the patient and the extent of the lung signs which as reported in literature are equally distributed on both sides. A true case of tuberculosis of the lung with such extensive equally distributed signs would have a fairly high level of temperature whereas a case of eosinophilia has mild constitutional symptoms as compared with the extent of physical signs. In tuberculosis, signs are more localised and hardly show equal distribution.

I submit that with a little experience and proper attention to the above 2 points a case of eosinophilia of the lung can be more or less accurately differentiated from a case of tuberculosis of the lungs. I am etc.

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